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A Case of Nasal Tumour of Filarial Origin

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Filarial tumours have not been previously described in India and two communications on the subject have been published by me in the Press, one having appeared in the Indian Medical Gazette, Oct. 1931 and another in the Journal of Tropical Medicine and Hygiene, London, in March, 1932. I am combining all the observations so far made in this connection in the present paper as it is not unlikely that the worm I have described might turn out to be different to those previously recorded as the cause of similar tumour formation. With one exception, the illustrations connected with this paper have already appeared in the Journal of Tropical Medicine and Hygiene and I am indebted to the publishers of that Journal for permission to make use of the same photographs in connection with this communication.

A child aged six months was admitted in the Ear, Nose and Throat Department of the Sassoon Hospital with the O. P. D. diagnosis of "*dermoid cysts* ?". There were two tumours in the fronto-nasal region, one on either side. They had commenced to show themselves, when the child was barely two months old, as small pimples and had gradually grown to the size of a walnut at the time of admission. There was a protrusion of the eye-balls as a consequence of pressure, a fact that was confirmed after removal of one of the tumours. The swelling on the right side was larger than that on the left. Neither the parents nor the child had ever left Bombay Presidency.

DR. MANDLIK, the officer in charge of the Ward, removed the tumour of the left side. This tumour was found to be solid in its upper part and cystic in the part nearest the nostrils. The cystic part burst during removal, allowing the escape of a straw-coloured fluid. When the growth was excised, it was found that the septum was perforated, while the tumour of the opposite side was protruding through this perforation. Five days after the operation, however, it was found that the right tumour had suddenly diminished in size, the child having as suddenly become unconscious. The skin over the tumour was simultaneously found to have lost its redness and shiny appearance and that it had wrinkled considerably. The inference was apparently justifiable that the cystic portion had ruptured into the brain through the orbit, though this could not be maintained with certainty. A day later the child died. No P. M. could be had.

DR. MANDLIK thought that the tumour was a meningocele or a neoplasm and sent it to me for examination. The solid portion was cut and on examination it was found that there was a fibrous capsule, staining a brilliant carmine with van Gieson. In the meshes of the fibrous tissue there was a variable number of eosinophile and plasma

cells. In the mucoid material inside the capsule one could discern many embryos and also longi-

Figure I. The fibrous capsule.

tudinal and transverse sections of a female parent worm. The cuticle of the parent worm showed in some of the sections what appeared to be transverse striae. This could not be said

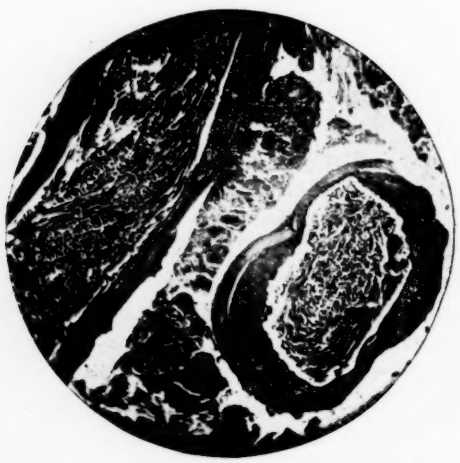

Figure II. Longitudinal and transverse section of the worm as seen in sections.

of all the sections and the element of shrinkage has to be borne in mind in assigning a value to this appearance. Stained with van Gieson, the cuticle of the parent worm could be seen to retain the acid fuchsin stain much longer than the muscular layer, so that after a suitable differentiation the muscle could be shown to be yellow, while the cuticle still retained the carmine tint. Stained with hæmatoxylin and biebrich, most sections showed that the cuticle had apparently three zones, a central purplish with a lighter pink band on either side. This appearance was, however, not uniform in every section and was not present in sections stained with Giemsa or van Gieson.

As already stated only sections of the female worm have been observed. About 50 sections have been carefully scrutinised with the object of ascertaining the presence of a male worm but without any success. In every instance the coelomic cavity of the parent worm has been found filled with the uterus that contained no ova at all but was filled with embryos only. The

Figure III. Embryos in utero.

uterus was single and not convoluted. In my first communication on the subject, I had stated that most embryos were out of their sheaths but certain appearances had made me believe in the presence of a sheath. This idea I have abandoned on further scrutiny, though still a specimen or two

show an appearance that is extremely like that of an ensheathed *Microfilaria bancrofti* in blood

Figure IV. The same magnified.

smears. This appearance has been observed only in intra-uterine embryos. What I have previously described as fractured sheaths were but broken up and degenerated embryos which application of the Giemsa stain brought out very clearly. Giemsa

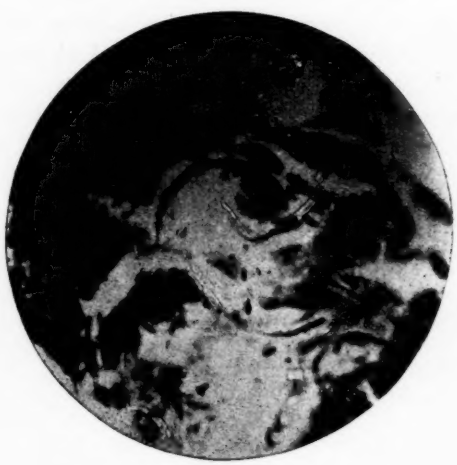

Figure V. Single embryo showing the characterestic tailing off.

stain seems to be well adapted to demonstrate changes in the microfilaria. I have measured a good many embryos by now and have found embryos between 300m and 450m long and between 12m and 17·5m in breadth. The average dimensions in the specimens seen in sections are about 350m by 15m. The tail in most specimens is about 75m in length. The embryo is broadest in the middle, the anterior end being narrower than the middle, while the posterior end narrows more or less suddenly at the junction of the posterior fifth with the rest of the body and forms the whiplike pointed tail. As previously stated this is not recurved but is stretched at full length.

From appearances in sections, one can discern fine transverse striae in the cuticle of the embryo. These striae are not perceptible at the anterior end and as the tail is reached the striations are found to show greater spacing. Very few embryos have been seen with what appeared to be closely packed but badly defined striae at the tail end. As they could not be distinguished clearly enough, I have not described them in my previous papers. Unfortunately, one has to reckon with degenerative changes and action of chemicals in studying sections of worms, so that one cannot be quite certain as to whether the details observed actually represent what one would see in the fresh state.

In the less altered embroys—I base this assumption on the better preservation of the nuclei to be described directly—these transverse striae cannot be distinguised sufficiently clearly, On lowering the condensor of the microscope, however, one can discern a brilliant serrated and highly refractile line along the entire length of the embryo on either side. This feature is particularly well brought out in sections stained by Giemsa's method. Except at the anterior extremity and a portion of the tail, nuclei can be seen along the whole length of the embryo. There is also a small nucleus free space at the junction of the anterior fifth with the rest of the body and in some specimens one can discern with some difficulty a badly defined oval cell with a nucleus. The nuclei in most specimens appear to be oval at the anterior end. I am more certain of the shape of the nuclei at the tail, the appearance of which is more uniform. One also gets the impression that the nuclei

are placed more ventrally, *i.e.*, more towards the concavity of the free embryo observed in the tissues. This appearance may possibly be occasioned by refraction but would seem to be fairly uniform in those specimens, the nuclei of which are more or less clearly discernible.

Figure VI.
Diagram representing the nuclear arrangement, transverse striations and general configuration of an embryo free in the mucoid material outside the parent worm.

It is evidently impossible on mere scrutiny of sections to form an opinion as to the position in the zoological scale of the worm under description. COL. ACTON, Director of the Tropical School of Medicine, Calcutta, who was interested in my photographs, expressed a desire to see the original slides and favoured me with the view that the tumour resembled that produced by the *Onchocerca caecutiens*. PROFESSOR WARRINGTON YORKE of Liverpool to whom the slides were referred for opinion, while stating that he could only say for certain that the tumour was filarial, suggested the possibility of the worm being the *Filaria conjunctivae* (ADDARIO). Personally, after a scrutiny of about 50 sections, I find it difficult to reconcile myself to either of these suggestions. There are features that appear to militate against the acceptance of these hypotheses. One has, however, to defer a positive opinion until the parent worms and embryos are fully studied in the fresh state. The facts that I would like to emphasise are the presence of what appears to be a single female worm, without any male; the filling up of the whole coelomic cavity by a single nonconvoluted uterus; the absence of ova; the apparent presence of transverse striæ in the cuticle of the embryo; the straight whip-like tail resembling the tail of the guinea worm embryo but occupying only one fifth of the entire length of the body; and the rather unusual situation of the tumour, so as to cause a perforation of the nasal septum. DR. MANDLIK, on close questioning of the parents of the child, felt inclined to believe that the tumour might have been present in the child much earlier than the second month.*

* Paper read at the Scientific Section of the VIII All-India Medical Conference, held in Calcutta March, 1932.

Comparative Birth, Death and Growth-Rates

A Study of the Nine Indian Provinces in the Background of Eur-American and Japanese Vital Statistics (with nine charts).

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I. BIRTH-RATES.

1. Nine Indian Provinces (1922-26).

For all practical purposes the period of five years in India, from 1922 to 1926 may be regarded as more or less "normal" from the socio-economic standpoint as well as from that of public health. Let us take the annual average of this quinquennium for each of the nine major provinces of British India in regard to the births per thousand inhabitants. These "mean" ratios will indicate a phase in the trend of the natural population movement or rather the present state of the conditions affecting the birth-standard of the majority of the peoples living in India.

The Indian scale of annual births per thousand (1922-1926) [1] looks as follows :

I. Above 40 per 1000 (for a total of 34·5 millions)

1. Central Provinces (13·9 mill.)	41·48
2. Punjab (20·6 mill.)	40·8

II. Between 30 and 40 per 1000 (for a total of 141 millions)

1. Bihar and Orissa (33·9 mill.)	35·6
2. Bombay (19·3 mill.)	34·17
3. United Provinces (45·5 mill.)	34·01
4. Madras (42·3 mill.)	31·7

III. Under 30 per 1000 (for a total of 67·3 millions)

1. Assam (7·5 mill.)	29·41
2. Bengal (46·6 mill.)	28·9
3. Burma (13·2 mill.)	28·36

The coefficient for the two areas comprising 34·5 mill. ranges between 40·8 and 41·48, that for four regions comprising 141 millions between 31·7 and 35·6 whereas that for the three comprising 67·3 millions between 28·36 and 29·41. The total range is therefore very extensive (from 28·36 to 41·48), and the average for all British India comes up to 33·35.

Some of these coefficients can become intelligible only if we place them in the perspective of certain figures in fairly large-sized European countries. Thus we have seven out of eighteen *compartimenti* (districts) of Italy,[2] namely, Sardinia (30·45 per thousand), Veneto (30·77,) Abruzzi e Molise (32·33), Campania (33·11), Calabrie (33·74), Puglie (34·59), and Basilicata (36·22) exhibiting in 1925 the range above 30 up to 36·22. The birth characteristics of Madras, the United Provinces, Bombay as well as Bihar and Orissa belong in pure statistics to these regions scattered as they are in different parts of the Italian mainland and islands. In other words, the men and women in the neighbourhood of, say, Benares and Lucknow, Poona and Ahmedabad, Patna and Gaya, etc. would not find it difficult to understand the conditions prevailing in the human hives of Naples and Salerno as well as Brindisi and Bari. Similarly the birth conditions in the surroundings of Rome (Lazio district 28·71) or of Venice, Padua and Verona (Veneto) would appear assimilable to those to

(1) *Annual Report of the Public Health Commissioner with the Government of India for 1926*, Vol. I. (Calcutta, 1928) p. 9

(2) *Compendio Statistico* 1930 (Rome), p. 36

N. B.—The tables and charts are based on the figures in *Annuaire Statistique International* (Geneve) for 1928, *Statistisches Jahrbuch fur das Deutsche Reich* (Berlin) for 1928-30, *Compendio Statistico* (Rome) for 1930, Woytinsky : *Die Welt in Zahlen* Vol. I. (Berlin 1925), and *Tatsachen und Zahlen Europas* (Vienna 1930). *The Financial and Economic Annual of Japan* (Tokyo 1926), and *Annual Report of the Public Health Commissioner with the Government of India for 1926* (Calcutta 1928.)

The discrepancies in figures between the different publications, wherever these are noticeable, do not as a rule go beyond 0·1 or 0·2 and may be ignored.

Wherever there are discrepancies between the charts and the tables used in this essay, these are to be accounted for by reference to the dates. The average for the decennium 1901-10 is not naturally the same as that for the quinquennium 1905-09 or 1901-05 and of course cannot be identical with the figure for a single year 1901, 1905 or 1910. Similarly while comparing the charts with the tables it would be necessary to pay separate attention to the figures for 1921-25, 1922-26, 1927, 1928 etc.

which the Assamese, the Bengalis and the Burmese are used.

It is more reasonable, however, to compare the birth-rates of Indian provinces with those of the single states of Europe rather than with those of the districts in the European states. As the largest province of India, Bengal, with its quinquennial mean 28·9 per thousand, can then be placed almost on a par with entire Italy (40 mill. in 1925) with 27·82 per thousand. When one analyzes the birth-figures intensively one finds, therefore, that statistically speaking one is hardly justified in using such expressions as the "Indian birth-level" or "European birth-standard" and so forth. It is evident that Bengal might be placed in Europe exactly where Italy happens to be and Italy might change place with Bengal in Asia.

2. International Birth-rates 1927.

To master the significance of the figures as registering the facts of international vital statistics on a more extensive scale let us examine the "world-standard" in the matter of births for the year 1927, [3] and we shall distribute the same quinquennial mean ratios from India (1922-26) in this medley of nations. It is possible then to observe the birth-behaviour of mankind as grouped in the following three classes :

I. Above 30 per thousand (1927).

(a) above 40 per thousand.

1.	R. S. F. S. R.	43·7	
2.	Egypt	42·7	
3.	Chile	41·5	
4.	Central Provinces (Ind.)	41·48	(1922-26)
5.	Punjab (Ind.)	40·8	(1922-26)

(b) between 30 and 40 per thousand

6.	Bihar and Orissa (Ind.)	35·6	(1922-26)
7.	Japan	35·0	
8.	British India	34·8	(1926)
9.	Bombay (Ind.)	34·17	(1922-26)
10.	Rumania	34·1	
11.	United Prov. (Ind.)	34·01	
12.	British India	33·35	(1922-26)
13.	Bulgaria	32·9	
14.	Portugal	32·4	
15.	Madras (Ind.)	31·7	(1922-26)
16.	Poland	31·6	
17.	Argentine	31·3	

II. Between 20 and 30 per thousand (1927)

(a) between 25 and 30

1.	Lithuania	29·4	
2.	Assam (Ind.)	29·41	(1922-26)
3.	Bengal (Ind.)	28·9	(1922-26)
4.	Spain	28·6	
5.	Burma (Ind.)	28·36	(1922-26)
6.	Italy	26·9	
7.	Hungary	25·2	

(b) between 20 and 25

8.	Canada	24·6	
9.	Tchechoslovakia	23·3	
10.	Holland	23·1	
11.	Australia	21·7	
12.	U. S. A.	20·6	(1926)
13.	New Zealand	20·2	

III. Under 20 per thousand (1927)

1.	Germany	18·3	
2.	Belgium	18·3	
3.	France	18·1	
4.	Austria	17·8	
5.	Switzerland	17·4	
6.	England and Wales	16·3	
7.	Sweden	16·1	

Let us call Group I the group of "high" birthrates, Group II will be the group of "medium" and Group III that of "low" birth rates.

3. Climatology and Birth-Index.

The high birth-rate group comprises seventeen countries, and as the range is rather extensive we have divided it into two sub-groups. In the sub-group (*a*) there are two countries in Asia, one in Europe, one in Africa and one in South America. A glance at the map will show that these five regions are distributed in the most "arbitrary" manner conceivable in the two hemispheres. There is, besides, hardly anything in common between these regions from the standpoint of climatic characteristics. R. S. F. S. R. is indeed huge enough to be described as a continent by itself and naturally embraces a diversity of temperature and rainfall. Even the two Indian regions,

(3) *Annuaire Statistique International 1928* (Geneve), p 23, *Statistisches Jahrbuch fuer das Deutsche Reich 1930* (Berlin), *Internationale Uebersichten*, p. 13*. 14*.

the Punjab and the Central Provinces do not belong to one and the same climatological zone. Nor does Chile exhibit the same physical, hydrographical and orological features as Egypt, the gift of the Nile. In terms of latitude, longitude, heat, moisture, rivers and mountain systems as well as currents of winds and proximity to the sea we have in this sub-group really five heterogeneous zones. And yet they constitute but one zone from the standpoint of demography, namely, the zone of high or rather highest birth-rates. Demographic cousins and relatives are not geographic neighbours or comrades. We encounter here a uniformity of socio-biological and socio-economic phenomenon even in spite of diversities in geography, meteorology and climatology. Birth-rates have reacted indifferently to the physical or physiographical conditions of the habitat.

The twelve countries of the sub-group (*b*) or rather ten (excluding the two counts of British India) point similarly to the same story. In this company Japan and the four Indian provinces belong to Asia, Rumania, Bulgaria, Portugal and Poland to Europe, and one, Argentine, to South America. Climatographically Japan certainly does not belong to the inland systems of the U. P. and Bihar in India nor of course of Poland in Europe. A high birth-rate zone has been constituted out of diverse physiographical conditions obtaining in the different quarters of the globe. There is no physical nexus, no local tie binding the demographic neighbours or relatives with one another. Communities possessing more or less the same birth-index do not flock together. They happen to be scattered broadcast in all directions. Reproductive virility has manifested itself to one and same extent under diverse suns and stars. In another way of looking at things we find that fecundity like adversity "makes strange bed-fellows." Demographic Japan can thus be sandwiched between Bihar and Bombay, the Indian U. P. between Bulgaria and Rumania in the Balkans, and Poland of European inland between the sea-washed Argentine of South-America and the sea-washed Madras of Southern Asia. In all these cases the birth lines have to be drawn independently of reference to the isotherms and ocean-streams.

The second group, that of "medium" birth-rates comprises thirteen countries, and these again as usual are widely distributed throughout the world. This again admits of a division into two sub-groups. We find that Italy finds herself between Burma and Hungary, Burma between Spain and Italy, Assam or Bengal between Lithuania and Spain, Tchechoslovakia between Canada and Holland, the U. S. A. (virtually a continent like India and Russia) between Australia and New Zealand. It is to be observed that three Indian regions, namely, Assam, Bengal and Burma, belong to the group of medium birth-rates and that indeed Italy's birth-rate (27·82) for 1925 is almost the same as Bengal's annual mean (28·9) for 1922-26. Altogether, the continuity of the slow curve from 20·2 up to 29·4, covering as it does thirteen regions, is quite patent. It is equally patent that this demographic continuity is not paralleled by a geographical propinquity and affinity or continuity of heat-zones or rain-zones or other physico-physiographic zones. Zones of medium birth-rates are then, like those of the high birth-rates, independent of geographical position and climatological complex. We notice once again that one and the same fecundity-chart has to be plotted out and superimposed on the most diverse meteorological and climatological charts. As long as the Bengali is a close demographic neighbour or cousin to the Lithuanian of Northern Europe and the Italian of Southern Europe human reproductivity is to be treated as capable of flourishing with one and the same degree of virility under the most varied physico-physiographical conditions. (4)

4. The Race-Factor.

We shall now examine the zones of high and medium birth-rates from the standpoint of

(4) Friedrich: *Minerva Atlas* (Leipzig), p. 5-10 (Das Wetter, Das Klima I, II)

their racial make-up. To take the highest birth-index first. We find that it is represented equally by the Slav and Slavo-Tartar and other hybrids of Northern and Eastern Europe, the Arab, Arab-Copt and other hybrids of north-eastern Africa, the Latin (Spanish) and the Latin-American "Indian" and other hybrids of South America as well as the "Indo-Aryans", Aryo-Dravidians and other hybrids of Northern and Central India. Be it observed *en passant* that racially the Punjabi does not belong to the same stock as the Marathi-or Hindi-speaking Indians of the Central Provinces. Race-mixture is an ethnic fact in all the five regions of the sub-group (a) in the Group I as really in every group of mankind. For our present purpose it is only necessary to note that reproductivity is distributed far and wide amongst the most diverse races. There is no special ethnic affinity or comradeship between the peoples which agree in the actual reproductive facts. The most thickly coloured birth chart of the world is not characterized by any special sets of anatomical or physiognomic features, any characteristic skin pigment, construction or colour of the eye, nasal angle, or hair form. Vital statistics have succeeded in bringing together under one cover men and women from the ethnologically very distant groups.

The diversity of ethnic elements is no less manifest in the sub-group (b). The "Mongolians" of Japan, the Scytho-Dravidians of India, the Latins and Slavs of Europe, the "Spanish-Americans", and what not have met on a common platform in order to exhibit the birth-index of 31·3 to 35·6. The Tamils and Andhras of Southern India are found to be intimate comrades of the Poles, Portuguese and Bulgars, and the Biharis, Oriyas, Gujaratis and Marathas close companions of the Japanese. Ethnological charts have indeed to be forgotten while one seeks to plot the fecundity-charts of mankind.

Then, take the zone of medium birth-rates. Here also in the sub-group (a) the Slav shakes hand, with the Latin and the Magyar, and all the three with the Assamese, Bengali and Burmese, *i.e.* the Mongolo-Dravidian, Aryo-Dravidian or predominantly Mongolian elements in the Indian stocks.

In the sub-group (b) we come across a new race, the Teuton. The Teutonic element is predominant in all the six regions. But neither in Canada nor in the U. S. A. is it the exclusive factor. Indeed the Teutons are co-citizens here with the Latins and others; and in Tchecho-slovakia the Slav again shakes hands with the Teuton. The lower level of the medium birth-group (20 to 25 per thousand) is thus like the upper quite multi-racial. It is noteworthy, however, that while the Slav and the Latin are in evidence as much in the high as in the medium birth-groups, and the Latin can go further down, as we shall see later, the Teuton's birth range does not extend to the high, nay, does not transcend the lower level of the medium. While conscious of this distinctiveness it is still possible to observe that birth-index has made the Slavs, Latins, Magyars and Teutons "bed-fellows" of one another. And so far as the sub-group (a) is concerned it is no less obvious that the immediate demographic neighbours of the people of Bengal are the Latins of Spain and Italy and the Slavs of Lithuania. Altogether, then, the charts of human reproductivity can ignore the charts of ethnography.

The category "race" is being used here in a comprehensive sense so as to include not only blood-element and the items of physical anthropology but some of the "cultural" elements as well, for instance, 1. religion and 2. marriage customs. But we may take these cultural items separately also, and we have to observe that the Moslems of Egypt, the Greek (Orthodox) Catholics of Russia, the Roman Catholics of South-America, as well as the Hindus and Moslems of certain regions in India, however much they differ in cult, rites, ceremonies, and superstitions, agree in keeping the birth-index at the highest level. Some of the members of these religions exhibit a somewhat lower level too, and in that good company seek the Buddhists of Japan also a place. It is to be observed that the "wandering Jew" is to be found in each of the two sub-groups of five and ten regions.

All these religions and their denominations are no less represented in the zone of medium birth-rates. One important item to note is the appearance of the Protestants as a new element in the faith factor of the birth-charts. The index-range from 20·2 per thousand to 25·2 per thousand,—the lower level of the medium group,—is a noticeable feature of Protestants. But it is to be observed that neither in the U. S. A. nor in Canada nor in the other five countries can Protestantism be regarded as the sole religious denomination. The Catholics and Jews also play an important role in these countries from the standpoint of number and have therefore to be cited as to a certain extent responsible for the mediumness of the birth-rates. Then, again, in Spain and Italy the Roman Catholics are preponderant and Roman Catholicism can therefore claim the medium birth-rates for itself. The same may be claimed likewise by Hinduism in Assam and Bengal as well as Buddhism in Burma. It is obvious therefore that medium index is not the exclusive feature of any particular religion or custom, but that like the high index it counts among its contributors all the great and small religions and denominations of the world. Religion can therefore be ignored by international birth statistics.

To avoid misunderstanding it is proper, however, to note especially that Protestantism is hardly, if at all, in evidence above the birth-index of 25 per thousand. The other religions, however, begin at the topmost and come down to 25 and even to 20. And as we shall see later, Roman Catholicism can go hand in hand with Protestantism in bringing the birth-index much lower than 20 per thousand.

5. POLITICS AND BIRTH-STATISTICS.

Leaving the noteworthy features of Protestantism aside for the present let us step out of race and religion into the domain of politics, and we find that the birth-charts are as indifferent to political as to ethnographical and climatological charts. In the high birth group Egypt is a semi-subject country, the six Indian provinces are subject countries, the remaining ten are independent countries and among these last, indeed, two, Russia and Japan, are known to be "great" or "first class powers." The degree or kind of political independence has failed to engender typical birth-coefficients "natural" or necessary to each and to bring about a distinction in fecundity between the different peoples. No matter whether the peoples are subject, semi-subject or free, one touch of reproductivity has made them all kin, and vital statistics brought them together under one roof. A birthrate-kinship prevails in the midst of political diversities in the medium group also where again two "great powers," Italy and the U. S. A., are on terms of vital intimacy with what may be described as political minors or inferiors. Indeed, Italy (28·9 for 1925) is the closest neighbour to the the subject countries, Bengal and Assam. Evidently even with medium birth-rates certain countries can win freedom, for instance, Hungary, Lithuania and Tchechoslovakia, and others maintain their political independence as well as become great powers. Similarly a high birth-rate has not prevented Poland from acquiring independence or Argentine, Portugal, Bulgaria and Rumania from maintaining it intact. Nay, with a birth-rate higher than Bombay, the United Provinces and Madras, Japan can still be a first-class power, and of course Russia which with 43·7 per thousand beats even the Central Provinces and the Punjab and indeed tops the list of international birth-rates has always been regarded as a first-class power.

The situation does not change if instead of general facts bearing on sovereignty the constitution or form of government is under consideration. It is self-evident that in every one of these four sub-groups the form of government is varied. Peoples with the monarchical constitution (England and Sweden) are found to be demographic bed-fellows with the republican peoples (France and Switzerland). Birth-charts have not followed any constitutional maps. Neither republic nor monarchy can be described,

on the evidence of facts, as in any special sense calculated to promote or hinder certain ranges of birth-coefficients.

6. The "Low" Birth-Group of Today.

It is now time to attend to the low birth-group (16·1 to 18·3 per thousand). There are seven countries in this group. First, then, as regards geography and climatology. The Central-European regions, Germany, Austria and Switzerland, are fundamentally "continental". They differ essentially from the "insular" British Isles and sea-washed Sweden of Northern Europe. The heat-lines of the almost peninsular France, again, sharply differentiate her from Central Europe on the one hand and the Northern islands and peninsula on the other. In spite of all these physico-physiographical diversities the regions have been made to move to one point under the magic wand of birth-behaviour.

While discussing the climatological conditions of the high, medium or low birth-rates it is perhaps desirable to direct attention to a fact of rather universal importance in the economic structure of mankind. In ancient and medieval times down to the beginnings of the industrial revolution the entire civilized world was the theatre of agricultural operations. Agriculture was indeed a synonym for civilization (Kultur). In other words, in spite of differences in latitude, longitude, heat-waves, wind and sea currents, mountains, rivers and so forth the valleys of the Nile, the Euphrates, the Hwangho and the Indus, as well as the regions of Hellenic and Latin culture, Gaul, Britain, Prussia, the countries of Northern and Eastern Europe were all agriculturally fit enough to be in the main self-sufficient in food and raw materials of the handicrafts. Even today all the different corners of the two hemispheres with the exception of actual deserts and the Arctic and the Antartic zones are agriculturally fit to maintain quite a mass of human beings unless of course the people themselves choose to neglect agriculture in the interest of some other economic activities. The world was and continues to be pretty uniform in its food-foundations. Those who would care to interpret birth-rates or fecundity-index as but the function of food-resources would naturally try to explain the distribution of uniform rates in the diverse regions as but occasioned by the fundamental climatological uniformity of the habitable globe. And in their "agricultural interpretation" of population there can hardly arise any problem as to the diversity of climates, because pragmatically these differences are not important enough to prevent the soils from being utilized for agriculture and the allied occupations.

This view of the fundamental agricultural uniformity, and what is the same thing for the present purpose, of the fundamental climatological uniformity of the Earth's surface may however, be ignored as too wide, vague and metaphysical or monistic. We have to look intensively and objectively to the local diversities in the Sun's rays, heat, rainfall etc. and attach to them the importance they deserve for practical agronomy and health considerations. In the course of this realistic survey we encounter a very curious phenomenon in regard to fecundity on the strength of actual facts unearthed by the statistics of world-economy. It has to be admitted that in regard as much to the low birth rates as to the medium and high the peoples exhibiting them happen to inhabit regions that are climatologically very varied. Birth-charts and climate charts do not go hand in hand.

Now as to the race-factor in Group III. France, Belgium and parts of Switzerland are Latin (and Celtic), England and Wales Teutonic (and Celtic), Germany and Sweden Teutonic (and Slav), while Austria and the rest of Switzerland predominantly Teutonic. It is important to observe that the Slavic and especially the Latin race are quite significant as contributors to the low birth-rates of the contemporary world (France 18·1, Belgium 18·3). On the other hand, it cannot be ignored that it is the Teutonic element that is today chiefly associated with the low group of birth-index, and as we have observed before, it does not transcend the lower level (up to 25 per thousand) in the medium group. But all the same, as long as the Latins

(and Celts) of France and Belgium are demographic neighbours of the Teutonic Austrians, Swiss and Germans it would not be possible to associate the low birth-rates with any one race exclusively.

Similarly in regard to religion, England and Wales as well as Switzerland to a considerable extent, Germany (64%) and Sweden preponderantly happen to be Protestants. They are matched however almost equally by Belgium, France and Austria which are nearly wholesale Catholic. Here, again, the "wandering Jew" has to be noticed in all the seven countries. Protestantism cannot get exclusive credit or discredit for the low birth rates, the "international birth strike", although the fact that even in the medium group it does not exceed the 25 per thousand limit requires to be noted as a characteristic. The Catholics happen to be nearly on a par with the Protestants in the lowering of birth-rates, proving once more that the birth lines of nations move independently of religious lines.

Finally, as regards politics and constitution, the low birth-group is as varied as the two other groups. The component members of this group are monarchists as well as republicans. Even under monarchy the birth-rate has actually been low.

7. THE SOCIOLOGY OF THE BIRTH-INDEX.

An interesting order of facts comes out of an analysis of the three groups of birth-index. It is obvious that each one represents 1. a multiplicity of climates, 2. a multiplicity of races and religions, and 3. a multiplicity of political conditions. Statistically, therefore, cold regions do not invariably exhibit a high birth-rate nor invariably a medium nor invariably a low one. Certain temperate regions are found in Group I, certain others in Group II and again in Group III. And so on. Similarly, the Slavs and Latins are distributed in all the three groups. The Indo-Aryans and Mongolians are found in Group I and II, and the Teutons in Group II and III. The Roman Catholics exhibit high, medium as well as low index, Hindus and Buddhists high as well as medium. Last but not least, politically free peoples do not always go in for low birth-rates nor do subject peoples specialize exclusively in the high index. The "great powers" are numerically two in the high, two in the medium and three in the low birth-groups. Comparative vital statistics leads then inevitably to the conclusion that each of the 1. climatic, 2. ethnographic and 3. political conditions can represent a multiplicity of birth-groups. A parallelism of the two sets of phenomena is out of the question.

The following sociological conclusions may now be drawn from the foregoing analysis of the contemporary birth-rates :

1. Mankind today or rather the major portion of it may be divided into three or really five different birth-groups in the descending order, namely,

1. 40—45 per thousand
2. 31—36 „ „
3. 25—30 „ „
4. 20—25 „ „
5. 16—19 „ „

2. The Indian peoples find themselves in the first three groups.

3. In none of these three groups do the Indian peoples find themselves in "splendid isolation." In each they are in good company with a large number of non-Indian and non-Asian peoples.

4. In none of the five groups can the birth-rate be described as a "function" of (1) climate, (2) race and religion, and (3) politics. Nor can any of the three factors be described as calculated to generate exclusively the birth-rate of any particular group.

(*a*) Different conditions of climate do not prevent the rise of a more or less uniform birth-index. On the other hand, the uniform climatic conditions have given rise to diversity in birth-index.

(*b*) Different races and religions have been associated with one and the same or allied birth-rates; and again a unifor-

mity in birth-index has not been in evidence under more or less uniform racial and religious conditions.

(*c*) The divergence of political and constitutional systems has not militated against the rise of a more or less uniform birth-rate, whereas even under uniform political and constitutional circumstances the birth-index has been diverse.

There is no natural and necessary connection between the birth-rate and any of these three factors. The contemporary birth-rates of nations exhibit a profound independence of the geographico-ethnologico-political circumstances.

5. That is, a climatological, ethnographical or political "interpretation" of population (and birth-index) is not justified by comparative statistics. The birth-rate in each group is actually independent of these three factors. And again each of the three factors can have its own birth-rate or group.

6. An Indian or Asian birth-index (in the sense of certain birth-rates as being exclusively Indian or Oriental in geography, race or polities) does not exist, nor does a European or West-European.

7. Ethnologically, the birth-index of Teutons and Protestants is an interesting feature of vital statistics. This, however, does not form an exception to the general indifference of birth-rates to climatic, racial and political circumstances, as will be demonstrated subsequently.*

8. The birth-index of nations is then to be explained, if a really scientific explanation is possible, more perhaps by biological than by non-biological considerations.

9. The "independence" or "indifference" of birth-rates, or the absence of parallelism between them and geographico-ethnologico-political conditions must not however be misunderstood so as to imply that climate as such has no benevolent or malevolent influence on births, that human beings *as human beings* do not by their religious, marital, civil or other customs and laws consciously or unconsciously seek to enlarge or control the size of the family. Objective statistics indicate simply that no special case may be pragmatically made out for or against certain geographical areas, racial factors or political conditions in regard to the birth-rates *as they actually obtain in the world today*. Whatever may be the conscious contributions or unconscious effects of all these agencies we find that in terms of concrete reality, namely, the birth-rate, the result does not vary simply because the agencies happen to be diverse. This is why two climatic neighbourhoods do not invariably give rise to demographic neighbours *i.e.* peoples with more or less the same birth-index. This is why, again, the Catholics in one group exhibit the high index, in a second group they exhibit the medium, while the low is exhibited by them in a third group. And this is why, further, one republic can find itself in Group I, a second in Group II, another in Group III, and so on.

10. A conscious "population policy",—be it in the direction of large family, birth-control or stationary state,—may still be embarked upon by every group of human beings, no matter what be the region or the race, according to the requirements of the hour.

11. It should perhaps seem to be theoretically possible—within the biological limits, of course—to develop any desired or desirable birth-rate in any and every region, for any and every race and under any and every form of government. And the failure to attain the result need not necessarily have to be attributed to the conditions of region, race etc.

12. Finally, it is for the human will to decide whether the population policy is to be "passive" or "active", negative or positive, and with what velocity that policy is to be carried out.

8. The Dynamics of the Birth-Rate.

The birth-coefficient is not a fixed entity in the world of living beings. The annual average for all British India during the quinquennium 1921-25 is 33·4 per thousand inhabitants. But this is the level to which the birth-rate came

* Infra, p. 388.

down in the course of twenty years. The annual average during 1905-09 was 37·7 per thousand. The provinces of British India, then, are examples of the declining birth-rate. In this respect the "behaviour" of the Indian people has been but parallel to that of almost every country in Europe for which the data are available.

Let us take the two quinquennial periods 1905-9 and 1921-25 and place the average annual birth-rates of the "great powers" along with India in one table as follows : (5)

Regions :	1905-09	1921-25	Percentage Rates of Variation − or +
1. Russia ...	45·5	44·1	− 3·0
2. India ...	37·7	33·4	−11·4
3. Italy ...	32·6	29·2	−10·4
4. Germany ...	32·3	22·1	−31·5
5. Japan ...	31·9	34·6	+ 8·4
6. England and Wales	26·7	19·9	−25·4
7. France ...	20·1	19·3	− 3·0

The list is incomplete because it is not possible to obtain comparable figures for the United States. But in this region also the decline in the birth-curve can be to a certain extent demonstrated by the number of children under 5 years of age for every thousand women between 16 and 44, for instance, in the following table : (6)

Year :	Number of children :
1800	976
1820	928
1840	835
1860	714
1880	635
1900	541
1920	467

For actual birth-rates in the United States the following may be cited :

Year :	Per thousand inhabitants :
1921-25	22·6 (annual average)
1926	20·6

In each of the five great powers of Europe in the above table the tendency to decline is quite manifest. The decline has indeed been noticeable in every country of Europe * since *c* 1861-70 with the exception of Portugal and Bulgaria where the tendency between 1891 and 1910 was in the opposite direction and has continued to be so since then. To this exceptional group belongs the Asian great power, Japan, as noted in the comparative table.

The Japanese birth-rates per thousand since 1871 can be seen as follows :

1871-1880	25·1	(annual average)
1881-1890	27·2	„ „
1891-1900	29·8	„ „
1901-1910	32·0	„ „
1921-1925	34·6	„ „

If we leave Japan out of sight we may then take the declining birth-rate to be the universal phenomenon of vital statistics for most of the recorded regions of the contemporary world. Naturally, therefore, this sociobiological item has to be accepted as a fact of the world-economy.† We have now to observe that the order of regions in 1921-25 is the same as in 1905-09. That is, although there has been a decline in each the rates of decline for the different regions have not been too revolutionary or epochmaking so as to lead to a change in their positions. (By 1928 however the line for England is lower than that for France). India's rate of decline in comparison with that of the European great powers can be envisaged below (in percentage) :

1. Germany :	31·5
2. England and Wales :	25·4
3. India :	11·4
4. Italy :	10·4
5. Russia :	3·0
6. France :	3·0

The chart I. indicating the dynamics of the birth-rate shows (1.) that Germany's decline is the steepest, (2.) that France and Russia are almost equally stationary or slow to move, (3.) that India's curve is slightly steeper than Italy's and (4.) that both Italy and India are moving slower than England and Wales in the downward march. The exceptional birth-line is of course

(5) *Annuaire Statistique 1928*, p. 23.

(6) W. F. Wilcox : "The Change in the Proportion of Children in the United States" *(American Statistical Association 1909-11)* ; E. M. East : *Mankind at the Cross-Roads* (New-York 1925), p. 269.

* In France the tendency is noticeable much earlier.

† It is certainly reasonable to hold that the decline has to be explained in each region by its own peculiar circumstances.

that of Japan which ascends instead of descending. The Indian rate of decline, 11·4 % in twenty years, is deep enough. It comes after the German and the British and is just ahead of the Italian.

One notices that the contribution of the provinces of India to the declining birth-curve of mankind is not inconsiderable. The variations in the birth-rate *in itself*, however, *i.e.* without reference to the dynamics of the death-rate and without reference to the technologico-economic conditions, possess hardly any significance in the sociological sense, *i. e.* in regard to the *Nahrungsspielraum* (play-field for food *i.e.* mouths in relation to the possibilities of maintenance) and the "optimum". As a purely biological phenomenon they may undoubtedly have their value. But should the almost world-wide drop in the birth-curve *as such*, and unaided by other circumstances, turn out to be an economic blessing, in so far as it may be said to bespeak a perhaps effective prevention of or hindrance to over-population, the peoples of India will have to be counted among those who have played a mentionable part in the world-economy of today. Be this as it may, it would not do, however, to overlook the actual, absolute birth-rate which is still very high, namely 33·4 per thousand, to the significance of which we shall address ourselves later.

9. The Birth-Lines of Nations in Historical Statistics (1821—1871—1928).

Since birth-rates do not happen to be statical magnitudes *i.e.* since they possess a history and represent different points in a moving curve, comparative vital statistics can acquire a new importance in the scientific study of economic and social phenomena. The three groups or zones of birth, high, medium and low are therefore found to possess an elastic and mobile character, and therefore the mutual relations between the groups are to be understood not as those between water-tight compartments but as those between several "going" concerns. All the peoples are moving, but not all at the same rate, some are moving faster, some slower than the others. Hence there is the possibility of one's catching up to or going beyond others in the birth-race, no matter whether it be towards numerical ascent, decline or stationariness. The members of the groups, therefore, cannot remain constant. The "highs" of one generation can become the "mediums" of the next and the "lows" of the third. From epoch to epoch the three groups are to be regarded as being composed of new members.

Let us take Group III of 1927 (16·1 to 18·3 per thousand) and study the history of the birth-rates [7] *i.e.* follow the birth-curve backwards in regard to the seven component members. The annual birth-rates per thousand on the basis of decennial averages are given below :

Countries :	1841-50	1861-70	1871-80	1881-90	1881-1900	1901-10
1. Germany	36·1	37·2	39·1	36·8	36·1	32·9
2. Belgium	—	32·2	32·7	30·2	28·9	26·1
3. France (1)	27·4	26·1	25·4	23·9	22·1	20·6
4. Austria	—	38·2	39·3	38·0	37·4	34·7
5. Switzerland	—	—	30·9	28·3	28·1	26·9
6. England and Wales (2)	32·6	35·4	35·5	32·5	29·9	27·2
7. Sweden	—	31·4	30·5	29·1	27·1	25·8

(1) 1821-30 : 31·0
(2) 1851-60 : 34·2

During 1901-1910 none of these seven regions would have been in Group III as defined in the classification adopted for 1927. That is, none exhibited the low birth range extending up to 20 per thousand. All were "medium" and "high"-rate zones. We should have five regions in Group II, namely, (1.) France, (2.) Sweden, (3.) Belgium, (4.) Switzerland, and (5.) England and Wales, all with the "medium", *i.e.* 20—30 birth-index. This statement will acquire a precise meaning, should the members of Group II during 1922-26 and 1927 be placed in the perspective of their demographic comrades of 1901-1910. We obtain the following equations :

(1) Italy (1927) with 26·9=Switzerland (1901-10) with 26·9
(2) Burma (1922-26) 28·36=almost England and Wales (1901-10) 27·2
(3) Bengal (1922-26) 28·9=almost England and Wales (1901-10) 27·2.

(7) Woytinsky : *Die Welt in Zahlen*, Vol. I. (Berlin 1925) p, 78., *The Financial and Economic Annual of Japan 1926* (Tokyo), p. 3, *Deutsche Wirtschaftskunde* (Berlin, 1930), pp. 21-22 ; Woytinsky : *Tatsachen und Zahlen Europas* (Wien, 1930), pp. 64-66.

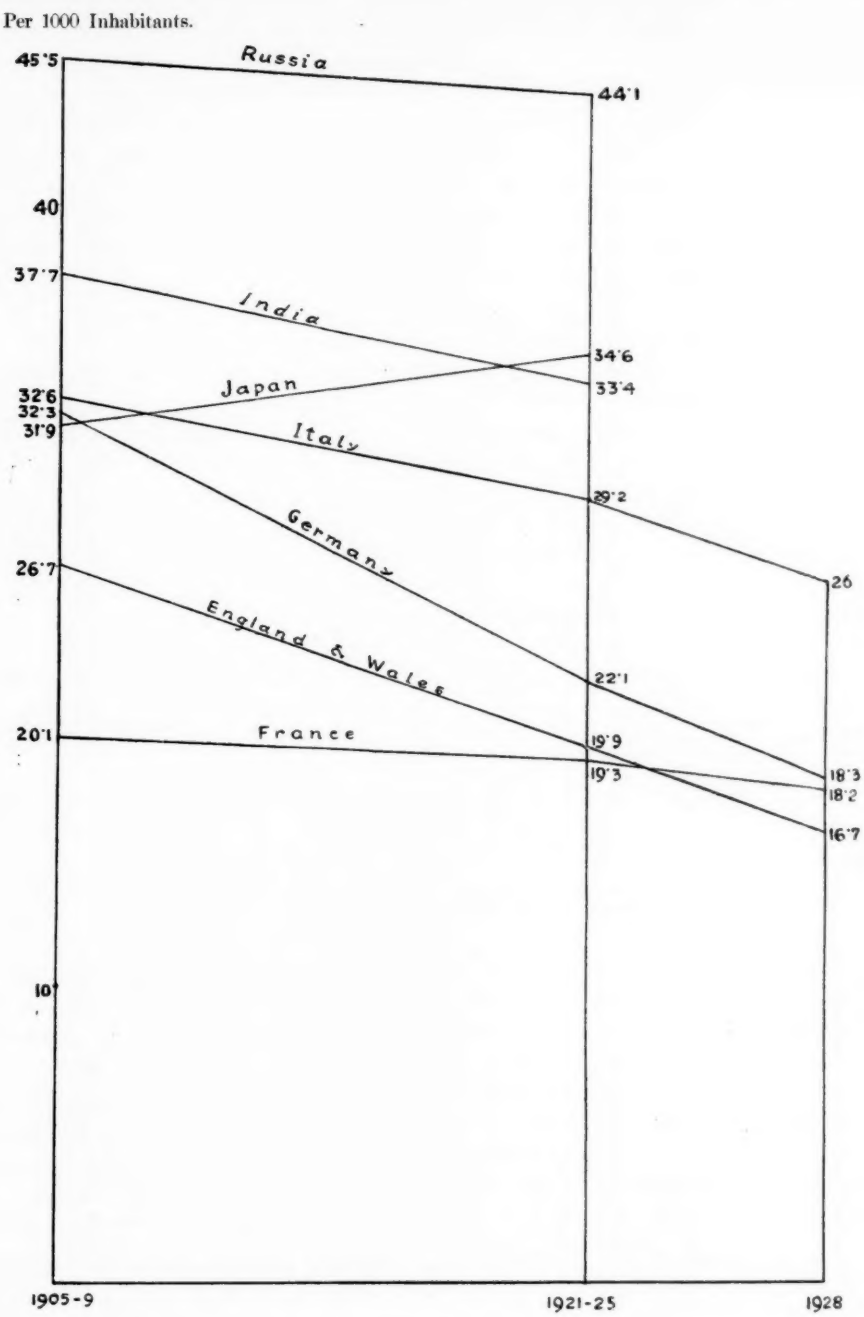
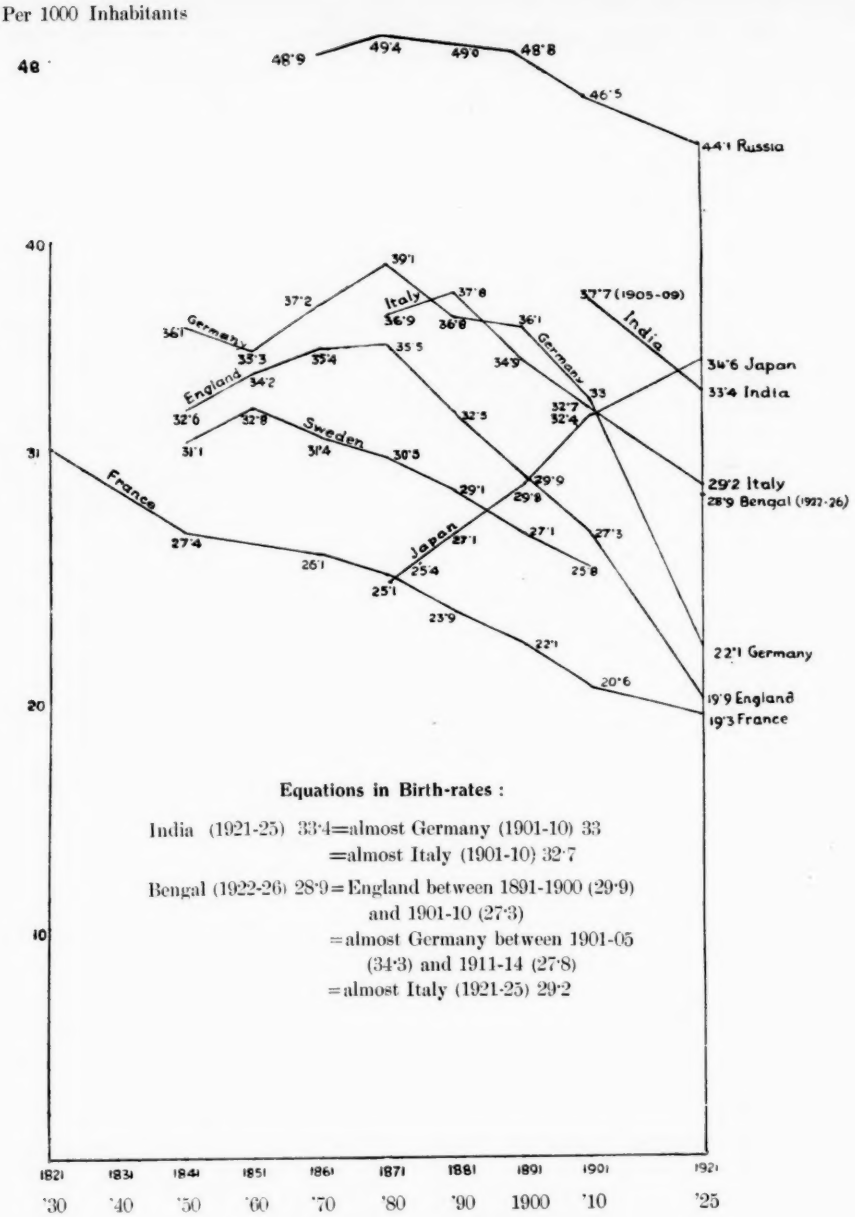


Chart I. Comparative Demography :
Dynamics of the Birth-rate.



Equations in Birth-rates :

India (1921-25) 33·4=almost Germany (1901-10) 33
=almost Italy (1901-10) 32·7

Bengal (1922-26) 28·9=England between 1891-1900 (29·9) and 1901-10 (27·3)
=almost Germany between 1901-05 (34·3) and 1911-14 (27·8)
=almost Italy (1921-25) 29·2

Chart II. Comparative Demography :
The Birth-lines of Nations.

We understand that the birth-rate in Switzerland during 1901-10 was exactly as high as that of Italy in 1927. And again, the British birth-rate of that decennium was not much lower than that of Burma or Bengal in 1927. In all these cases the demographical equality *i.e.* identity in the birth-rate is subject to a chronological distance of some twenty years.

In 1910, again, Germany and Austria had birth-rates above 30 per thousand. They therefore belonged not even to Group II but to Group I. That is, some two decades ago the Germans and the Austrians were exhibiting higher birth-rates than the Assamese, Bengalis and Burmese of 1922-26. Let us single out the exact demographic comrades of Germany and Austria from this latter period. The following equations will establish the comradeship :

1. Bulgaria (1927) 32·9 = Germany (1901-10) 32·9
2. Madras (1922-26) 31·7=almost Germany (1901-10) 32·9
3. Rumania (1927) 34·1 =almost Austria (1901-10) 34·7
4. United Provinces (1922-26)34·01= „ „ „ „
5. Bombay (1922-26) 34·17 = „ „ „ „
6. British India (1222-26) 33·35=between Germany and Austria (1901-10)

In 1927 Bulgaria possesses the same birth-rate as Germany during 1901-10. The difference is to be measured only by some two decades. The birth-rate in Madras during 1922-26 is somewhat lower than that in Germany during 1901-10. Similarly, Rumania in 1927 and the United Provinces and Bombay during 1922-26 exhibit a slightly lower birth-index than Austria of 1901-10. If we take the whole of British India we find that during 1922-26 with 33·35 per thousand the Indian peoples could demographically be squeezed in as intimate comrades between the Germans (32·9) on the one hand and the Austrians (34·7) on the other, as they were between 1901 and 1910.

The equations establish without doubt that the birth-index which is possessed today by the Latins, Slavs, Indo-Aryans, Mongols, Roman-Catholics, Greek-Catholics, Hindus, Buddhists and what not was exhibited by members of other races and religions some two decades ago. Historical statistics knows of no Latin, Catholic, Indian, Buddhist or Oriental birth-index. It is not long since the Teutons and Protestants used to exhibit the same birth-rates as some of the non-Teutons and non-Protestants of today.

Let us now analyze the birth situation of 1881-90. There are of course no "low"-rate zones. During this decennium France, Switzerland and Sweden would be the only three regions of the medium zone. The zone of the high birth-rate would be enriched with the acquisition of Belgium and England and would comprise altogether four regions including Germany and Austria. Some forty years ago Switzerland (28·3) had the same birth-rate as Burma (28·35) and Bengal (28·9) during 1922-26 and had a higher birth-rate than Italy (26·9) in 1927. Assam, Bengal and Burma during 1922-26 all exhibit a lower birth-index than Belgium (30·2) during 1881-90. And in not only these three but in Madras also the index is lower than in England and Wales (32·5) of some four decades ago. Lithuania (29·4), Argentina (31·3), Poland (31·6) and Portugal (32·4) are in 1927 regions of lower birth-rates compared to England and Wales of 1881-90. Once again have we to conclude incidentally that the Teutons, Protestants, or Europeans as known to historical statistics do not possess any speciality in regard to the birth-rates.

On the contrary, it is rather instructive to note that the declining birth-rate has not always been the fact of vital statistics. In the earlier years of the nineteenth century the tendency was mainly in the reverse direction as in Japan of today (Chart II). The ascending birth lines are registered below :

Decennium :	Germany	England and Wales	Austria	Belgium
1841-50	36·1	32·6	38·4	30·9
1851-60	35·3	34·2	37·6	30·3
1861-70	37·2	35·4	38·2	32·2
1871-80	39·1	35·5	39·3	32·7

One must not overlook the fact that down to 1880 the high birth-rates were rising both in England and Germany, *i. e.* among Teutons and Protestants. Evidently, a declining birth-rate cannot be considered to be the "function" or

speciality of the Teutonic race and Protestant religion. That race and religion have not played any part is proved further by the fact that simultaneously Austria, Teutonic but Catholic, was rising no less than Belgium, Catholic but Latin.

Still more curious in this connection is the circumstance that the country which set the ball rolling in the direction of birth-decline is neither Teutonic nor Protestant. It is France, a country like Belgium, Latin as well as Catholic. The French index of 1821-30, namely, 31 per 1000, was lower than the German index of 1901-10. At that time France was more than 80 years ahead of Germany and about 50 years ahead of England. Or perhaps when one remembers the vital statistics of the first generation of the nineteenth century one should say that Germany and England began more or less at the French level and entered upon a career of ascent up to 1880 and then went in for descent: whereas France has been steady and continuous along the downward path since the beginning. Teutons and Protestants are neither pioneers in this socio-biological phenomenon nor do they, historically speaking, possess any special tendency in this regard.*

10. The Equations of Comparative Demography.

An examination of the dynamics of international birth-rates enables us then to establish the following demographic equations with special reference to the provinces of India :

(1) Bihar (1922-26) 35·6
=almost England (1871-80) 35·5
=almost Germany (1896-1900) 36·0
= „ Austria (1901-10) 34·7

(2) Bombay (1922-26) 34·17
=almost England (1881-85) 33·5
= „ Germany (1901-05) 34·3
= „ Austria (1906-10) 33·7

(3) United Provinces (1922-26) 34·01 : almost the same as Bombay.

(4) Madras (1922-26) 31·7
=almost England (1886-90) 31·4
=Germany (1906-10) 31·7
=almost Sweden (1861-70) 31·4
= „ Belgium (1876-80) 32·0

(5) Assam (1922-26) 29·41.
=almost England (1896-1900) 29·2
= „ Germany (1911-15) 27·5 (?)*
= „ Austria (1911-15) 30 (?)*
=Sweden (1881-85) 29·4
=Belgium (1886-90) 29·4
=almost Switzerland (1871-80) 30·9

(6) Bengal (1922-26) 28·9
=almost England (1901-05) 28·2
= „ Germany (1911-14) 27·8
= „ Sweden (1886-90) 28·8
= „ Belgium (1896-1900) 29·0
= „ Switzerland (1881-90) 28·3

(7) Burma (1922-26) 28·36 : almost the same as Bengal.

Scientifically, it would not be reasonable for a statistician to compare the figures of a sub-continent like India with those of small areas like the seven European regions which belong to the low birth-rate group. And yet it may not be uninteresting to see the British Indian birth index for 1922-26 in the perspective of Group III. The following demographic equations will indicate the situation :

British India (1922-26) 33·35
=almost England (1881-85) 33·5
= „ Germany (1901-05) 34·3
= „ Austria (1906-10) 33·7

The rates that are exhibited by the Indian provinces from Bihar to Burma as well as by All-India are not characteristically Indian or Oriental or "Monsoon" rates. These are the rates that are also exhibited in Europe and elsewhere today, as we have seen before. What is more important in the present consideration is that the same rates were exhibited a few decades ago by almost all those peoples who constitute the zone of low rates at the present moment. The shortest chronological distance from these pioneers is to be measured in the case of Bengal and Burma. The peoples of these provinces—Indo-Aryans, Aryo-Dravidians, Mongolians, Hindus, Moslems and Buddhists—are about 20 years behind England and 10 to 15 years behind Germany. In other words, the birth-rate in Bengal and Burma as a purely biological phenomenon is not inordinately high, and in spite of tremendous advance in decline

* Supra, Section 7, p. 386.

* War-period

since 1880 neither England nor Germany happens to be more than two decades ahead of Bengal and Burma.

We shall now take the whole of British India because the Indian average is higher than that of Bengal or Burma and represents a much longer chronological distance from the pioneers. It is clear that the entire country is some 40 years behind England and 20 years behind Germany. By the Anglo-German standard the upper limit of modernism in birth-behaviour for India is to be found in the quinquennium 1911-14 and the lower in the quinquennium 1881-85. In vital statistics this South-Asian museum of races and religions is exhibiting the same birth-indices as the European hive of Teutons, Latins, Slavs, Protestants, Catholics, Jews and what not.

In Group III there is no place for four "great powers", the U. S. A., Italy, Japan and Russia. That is why while examining the Indian provinces as well as entire British India by the "world-standard" no notice has been taken of these four regions. But it would be worth while not only to see India in the light of these countries but also to see them by the same "world-standard" as above. Unluckily, it is not possible to get figures from the U. S. A.; and R. S. F. S. R. with 43·7 stands on such a high level that like the Central Provinces and the Punjab of India this region is "above comparison" because comparable figures from Group III are not available. Perhaps during the earlier decades of the nineteenth century or may be in the eighteenth, if the back chapters of population history would at all admit it, some of the countries of this group might exhibit the birth-rate above 40 per thousand.

Then, as regards Japan (35·0), her story is almost the same as that of Bihar and Orissa (35·6). From the standpoint of demographic equations she exhibits, therefore, the same chronological distance from England, Germany and Austria as does Bihar. Next remains Italy to be discussed. With 26·9 birth-index (1927) she is in the upper level of the medium group. In 1925 she exhibits 27·82 and is altogether a close demographic neighbour of Burma and Bengal. Whatever has been detected about Bengal may therefore be accepted with very little modification for Italy. But yet let us go into the Italian situation a little more closely, and we get the following equations : [8]

Italy (1925) 27·82
=almost England (1901-05) 28·2
=Germany (1911-14) 27·8
=almost Sweden (1891-95) 27·4
= „ Belgium (1901-05) 27·7
= „ Switzerland (1891-1900) 28·1

Italy's birth-rate has come down since 1925 as follows :—

1926	27·2
1927	26·9
1928	26·2
1929	25·2

At this point Italy (1929) 25·2
=almost England (1906-10) 26·3
= „ Germany (1921) 25·1
= „ Sweden (1906-10) 25·4
= „ Belgium (1906-10) 24·7
= „ France (1871-80) 25·4.

That is, Italy is behind Germany by some 7 or 8 years, behind England, Sweden and Belgium by some 18 to 20 years and behind France by some 50 years.

A comparison of Germany and England with France yields the following equations :

(1) Germany (1921-25) 22·1
=almost England (1911-15) 23·6
= „ France (1896-1900) 22·0

(2) England (1921-25) 19·9
=France (1906-10) 19·9

In 1921-25 Germany is behind England by some 10 years and behind France by some 20 to 25 years. About the same time England is behind France by some 15 years. In 1928 Germany with 18·3 has almost made up the distance from France (18·2). And France has been out-distanced by England with 16·7. The remarkable feature in this competition for lower birth-index consists in the fact that

Germany (1901-10) 32·9=almost France (1821-31) 31·0.

That is, during 1901-10 Germany was nearly 80 years behind France but in the course of some twenty years her progress in declining birth-rate has been able to catch up to the

(8) *Compendio Statistico 1930*, p. 34

French index. This must be regarded as a socio-biological revolution of immense proportions.

11. The Declining Birth-Rate as a World-Phenomenon.

The historical data of comparative demography enable us then to formulate the following propositions :

1. Throughout the second generation of the nineteenth century the birth-rate actually rose in England, Germany, Austria and Belgium, four of the regions which are today prominent in the "low" birth-rate zone.

2. The ascending curve reaches its peak in these four regions (as well as in Holland, Russia and Finland) round about 1880. This trend is exemplified by Italy, Serbia, Rumania, Hungary, Denmark and Norway down to 1890.

3. The peoples of Europe cannot therefore be described as naturally or characteristically inclined to a declining birth-rate.

4. For England, Germany, Austria, and Belgium the decline in birth-rate begins about 1880. But it is not before 1910 that it becomes sharp and steep.

5. The decline is altogether a phenomenon of less than a generation and a half since 1880-90.

6. The declining birth-rate is today an almost universal phenomenon for all statistically recorded mankind. Japan is a rare but important exception.

7. The provinces of India embody the declining tendency in a palpable manner.

8. Assam, Bengal and Burma (1922-26) exhibit more or less the Italian rate (1925). Throughout the nineteenth century and almost down to 1905 in England, down to 1910 in Holland, and down to 1914 in Germany and Austria the actual birth-rate was higher than in Bengal during 1922-26.

9. The average for all India (1922-26) is lower than the British rate from 1851 to 1885, than the German rate of the entire nineteenth century and down to 1905, and than the Austrian rate down to 1910.

10. All the same, the Indian average (33·35) is quite high, absolutely speaking, especially the rates in certain regions, namely, the Central Provinces (population 13·9 millions, birth-rate 41·48) and the Punjab (20·6 mill. ; 40·8), which, however, be it noted, are rather low population areas.

11. Even these two, the highest rates obtainable from India, are still lower than the Russian, Egyptian and Chilian rates of today.

12. A large number of European regions,—Teutonic, Slavic, Magyar,—used to exhibit this (40 and above) birth-index between 1870 and 1910 but have since moved away from it, as indicated below : [9]

	1861-70	1871-80	1881-90	1891-1900	1901 10
Bavaria	×	40·3	×	×	×
Saxony	40·5	42·9	41·8	×	×
Wuerttemberg	40·8	43·1	×	×	×
Hungary	×	43·4	43·9	40·5	×
Serbia	×	40 5	44·9	41·6	×
Rumania	×	×	41·4	40·6	×
Bulgaria	×	×	×	×	41·5

The Punjab is thus about 20-30 years behind Rumania, and the Central Provinces some 10-20 years behind Bulgaria. It must not be overlooked, however, that the Rumanian rate in 1927 (34·1) is higher than that of five Indian provinces during 1922-26, and the Bulgarian rate than that of four.

13. Neither historically nor statistically can the actual birth-lines of nations or the tendency of the birth-rates to rise and fall be associated in any significant sense with any special continent, geographical area, climatic conditions, race-factor, religious views or customs, or political conditions. It is understood, of course, that the natural forces (geography etc.) as well as human will (race, religion, constitution, "population policy" etc.) have contributed their part to the numerical growth of population, accelerating or retarding, enlarging or restricting it. But the historical demographic charts indicate that

(9) Bortkiewicz : *Bevoelkerungslehre* (Leipzig.. 1919), p. 28.

in the evolution of the birth-lines of nations their actual forms have been developed in an almost uniform manner, so far at any rate as the tendency is concerned,—no matter how varied all these natural and social agencies may have been.*

14. As long as the declining birth-rate is a world-phenomenon, it is likely to be explained, if it can be scientifically explained at all, in a satisfactory manner by something more fundamental than the agencies of the social sciences, *i. e.* by biology.

15. But so far as practical purposes are concerned, the operation of the human will should be regarded as the main determinant factor in regard to the birth-coefficient. Since the falling rate is (1) almost universal and (2) a phenomenon of but a generation and a half at the highest, it should be possible for any and every region, any and every race, any and every form of government to accelerate the fall, to retard it or even to counteract it,—within of course the fundamental biological limits. Regions and races which belong to Zone I today can rise up or go down to Zone II tomorrow and catch up to the compenonts of Zone III day after tomorrow. On the contrary, should the members of Zone III for one reason or another choose to declare a "strategic retreat" and care to go back temporarily or for some long time and take a position in Zone II or Zone III as they had 10, 15, 25, 30 or 40 years ago, they are at liberty to do so, no matter whether they be Teutons or Latins, Protestants or Catholics.

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* It should still be quite worth while to investigate the local conditions of every region on their own merits and analyze the details in each in an intensive manner.

II. DEATH-RATES.

1. Indian Deaths.

In regard to the economic and social efficiency of nations the coefficient of birth alone states hardly anything. It is nothing but the record of a biological phenomenon. The births acquire a meaning only in reference to the deaths. The coefficient of deaths in regard to each nation must therefore furnish the perspective of the birth-coefficients in order that vital statistics may serve a really useful purpose.

For the purposes of investigation in Indian deaths we shall follow the same method as in the case of Indian births. From the standpoint of annual deaths [1] per 1,000 inhabitants during 1922-26 the nine provinces of India may be grouped as follows :—

I. Above 30 per 1000 (for a total of 34·5 million inhabitants).

1. Central Provinces (13·9 mill.) ... 32·74
2. Punjab (20·6 mill.) ... 31·31

II. Between 25 and 30 per 1000 (152·8 mill).

1. United Provinces (45·5 mill.) ... 28·20
2. Bihar and Orissa (33·9 mill.) ... 26·9
3. Bengal (46·6 mill.) ... 26·3
4. Bombay (19·3 mill.) ... 25·36
5. Assam (7·5 mill.) ... 25·34

III. Between 20 and 25 per 1000 (for 55·5 mill).

1. Madras (42·3 mill.) ... 22·5
2. Burma (13·2 mill.) ... 20·97

The death-coefficients have been divided into three groups. In the first are to be found the C. P. and the Punjab each with more than 30 deaths per 1,000 inhabitants. The second group comprises the U. P., B. O., Bengal and Bombay whose coefficients range between 25·34 and 28·20. The comparatively lower coefficients, namely, 22·5 and 20·97, belong to Madras and Burma which therefore have been placed in a separate group. The 30 + coeffiicient is experienced by 34·5 million

(1) *Annual Report of the Public Health Commissioner with the Gorernment of India for 1926*, Vol. I., (Calcutta, 1928), p. 9.

inhabitants, the lowest Indian coefficients by 55·5 millions, but the majority of the people, namely, 152·8 millions, experience the range from 25·34 to 28·20. The coefficients for the individual provinces are on the whole high and the average for all India is 26·53.

Let us again take Italy in order to understand the mortality conditions of mankind in certain parts of Europe. In 1925 with a population of 40,077,000 inhabitants Italy's mortality coefficient was 16·8 which is thus nearly ten points below the Indian average. But certain districts of Italy exhibit death levels much beyond the average for the entire country. Even the Indian rates are not unknown in Italy. (2) It is possible to single out four *compartimenti* which may be described as quite Indian in death-conditions. These are mentioned below with their population and mortality coefficients for 1925 :—

Districts	Population.	Death-rate.
1. Basilicata :	468,557	22·32
2. Puglie :	2,307,762	21·01
3. Abruzzi *e* Molise	1,387,215	20·47
4 Campania :	3,243,739	20·36
Total :	7,407,273	

One notices that 7,407,273 inhabitants *i. e.* about 18·5 per cent of the total population in Italy are used to the death-standard of 20·36 to 22·32 per thousand. These are the conditions prevailing in Burma and Madras. Practically the whole of Italy to the south and south-east of Rome as well as the district to the immediate north-east of Rome including the wellknown regions of Naples and Salerno on the Mediterranean coast, the entire Adriatic side from Teramo to Bari and Brindisi experience the death coefficients to which 55·5 millions of South Indians and Burmese are accustomed. In Italy, however, the hinterlands of Naples, Brindisi and so forth represent the worst conditions whereas in India the Madras and Burma situations are the best. It is interesting to observe that the four districts Basilicata, Puglie, Abruzzi *e* Molise and Campania figure also among the Italian regions with high birth-coefficients and are thus "Indian" from the other angle too.

(2) *Compendio Statistico 1930*, (Rome 1930), pp. 36-37.

2. THE DEATH-COEFFICIENTS OF NATIONS.

The Indian deaths may now be placed in the perspective of comparative death-rates. So far as India is concerned we shall take the annual average for the quinquennial period 1922-26 and for the rest of the world we shall take the figures for 1927 (3). We can then get the following death-groups of nations :

I. Above 30 per 1000 inhabitants.

1.	Central Provinces (Ind.)	... 32·74
2.	Punjab (Ind.)	... 31·31

II. Between 25 and 30 per 1000.

1.	United Provinces (Ind.)	... 28·20
2.	Bihar and Orissa (Ind.)	... 26·9
3.	British India (1926)	... 26·8
4.	Bengal (Ind.)	... 26·3
5.	Bombay (Ind.)	... 25·36
6.	Assam (Ind.)	... 25·34
7.	Chile	... 25·3

III. Between 20 and 25 per 1000.

1.	Egypt	... 24·5
2.	Russia	... 22·7
3.	Madras (Ind.)	... 22·5
4.	Rumania	... 22·2
5.	Burma (Ind.)	... 20·97
6.	Bulgaria	... 20·2

IV. Between 15 and 20 per 1000.

1.	Japan	... 19·8
2.	Portugal	... 19·7
3.	Spain	... 18·9
4.	Hungary	... 17·6
5.	Poland	... 17·4
6.	Lithuania	... 17·3
7.	France	... 16·3
8.	Tchechoslovakia	... 16·0
9.	Italy	... 15·7

V. Under 15 per 1000.

1.	Austria	... 14·9
2.	Argentine	... 13·8
3.	Belgium	... 13·5
4.	Sweden	... 12·7
5.	England and Wales	... 12·3

(3) *Annuaire Statistique International 1928* (Geneve) p. 23 ; *Annuario Statistico Italiano 1930* (Rome) p. 29 ; *Statistisches Jahrbuch fuer das Deutsche Reich, 1928-30*, (Berlin). *Internationale Uebersichten*, pp. 13*, 14*.

6.	Switzerland	... 12·3
7.	United States	... 12·2
8.	Germany	... 12·0
9.	Canada	... 11·1
10.	Norway	... 11·0
11.	Holland	... 10·3
12.	Australia	... 9·5
13.	New Zealand	... 8·4

In comparative death statistics India should appear to be a veritable grave-yard of mankind. Group I with the exceptionally high death-rate (above 30 per 1000 inhabitants) contains only two regions both of which are in India. In Group II with coefficient between 25 and 30 there is only one non-Indian region, Chile in South America. It is first in Group III where the death-rate is still relatively high—between 20 and 25,—that a rather large number of non-Indian regions, some four, namely, Egypt, Russia, Rumania and Bulgaria, come to share kinship with India in mortality conditions. Madras (22·5) is just a little better than Russia (22·7), and Burma (20·97) just a little worse than Bulgaria (20·2).

It is clear also that neither in Group IV with coefficient between 15 and 20 which may be described as "medium" nor in Group V with "low" death-coefficients ranging as they do between 8 and 15 is there to be found any Indian region. India is not a sub-continent of low or even medium death rates. The best regions in India exhibit rates between 20 and 25 and they are but two in number. Most of the provinces in India are high-coefficient regions with between 25 and 30 deaths per 1000 and they are unaccompanied in their group by any statistically recorded region with the solitary exception of Chile.

As in the case of births, so in the case of deaths it has to be observed that each of the groups is heterogeneous in its geographico-climatic, ethnologico-religious and political conditions. Neither climate nor race nor religion nor form of government can be described as in any significant sense associated with any particular mortality-coefficient. Even with high death coefficient (22·7) higher than that of Madras, Russia can pass for a politically "great power", and Rumania can still be a politically independent country although her mortality rate is higher than Burma's. With one and the same mortality conditions the political fortunes of regions can thus be diverse. Mortality-comrades of the medium group (15-20 per 1000) are again not comrades in climate, race, religion or politics. More or less the same heterogeneity is likewise to be observed in connection with the regions that belong to Group V, the one with the lowest death-rates. The death-charts of nations,—like their birth-charts,—require to be plotted independently of the climatological, ethnographical and political charts. It is necessary, however, to observe that death rates, in so far as they are social as distinguished from biological phenomena, are directly related with the general hygiene and public health policy of nations.

3. Mortality and Equations of Economic Efficiency.

Leaving aside the question of public health and sanitary policy for the present let us investigate the economics of death rates from the standpoint of national efficiency. Death is essentially a waste of economic energy and economic resources. The higher the death rate in a people the higher the waste to which it is economically exposed and the less efficient it becomes in the struggle for economic self-assertion. Other circumstances remaining the same, the "natural" economic wastes to which the nations are exposed on account of death may be figured out on a comparative basis in the following equations for 1927 :

Bengal (26·3)=1·32 Japan (19·8)
=1·59 France (16·5)
=1·67 Italy (15·7)
=2·19 Germany (12·0)

We understand that in Bengal the economic wastes from death are 1·32 times as high as in Japan, 1·59 times as high as in France, 1·67 times as high as in Italy and 2·19 times as high as in Germany. The all-Indian average death-coefficient (26·8) is just a little higher than that of Bengal. The international comparison in wastes that has been described for Bengal may

therefore be taken to be equally valid for all India. And since England and Wales (12·3) and the United States (12·2) are just a little above the German rate (12·0), Bengal or for that matter India is in point of waste by death 2·19 times as prodigal as England and Wales as well as the U. S. A. among the "great powers." The other side of the shield, namely, the question of economic efficiency becomes no less clear from these equations. It can be seen that England, the U. S. A. and Germany are almost equal to one another in efficiency and that each of these regions is man for man 2·19 times as efficient as Bengal or India. From the standpoint of efficiency we can then establish the following equations :

1 German=2·19 Bengalis (as well as average Indians)
1 Italian=1·67 „
1 Frenchman=1·59 „
1 Japanese=1·32 „

It is clear, however, that the "great powers" themselves do not belong to the same "waste"-group or its obverse *i. e.* the same" efficiency"-group. Thus, in point of death,

Japan (19·8)=1·2 France (16·5)
=1·26 Italy (15·7)
=1·65 Germany (12·0)

In other words, in man for man efficiency

1 German=1·65 Japanese
1 Italian=1·26 Japanese
1 Frenchman=1·2 Japanese.

In regard to Italy the waste-equation is as follows :

Italy (15·7)=1·30 Germany (12·0)

and the efficiency situation is embodied in the following equation :

1 German=1·30 Italian.

Death is inevitable. But certain regions have higher death-rates and certain others have lower. The diminution of deaths is a positive economic weapon in the life's struggle of communities. The question of the death-rate is essentially an item in economic preparedness and therefore a fundamental problem in the economic statesmanship of nations. In international competition the diminished and the diminishing death-rate, wherever it has come to be an established fact, is a factor of profound importance, so far as the rationalization of economic resources is concerned.

4. The Declining Death-Rate.

Like the birth-rate the death-rate also is dynamic. And it is possible to institute a comparison between the nations in regard to their death-lines. Let us take the same two quinquennial periods for the death-rates as for the birth-rates, namely, 1905-09 and 1921-25. In the perspective of the "great powers" India's position would be as follows : [4]

	1905-09	1921-25	Rate of change in Death-rate + or −
1. India	35·4	24·9	−29·6%
2. Russia	29·4	24·1	−18·0%
3. Italy	21·7	17·0	−21·5%
4. Japan	20·9	21·8	+4·3%
5. France	19·5	17·3	−11·2%
6. Germany	18·3	13·3	−27·3%
7. U. S. A.	15·4	11·9	−22·7%
8. England and Wales	15·1	12·2	−19·2%

Now since every curve or line embodies an equation the death-wastes at two different points of time for each of the regions discussed above may be indicated in the following equations :

1. India (1925)=70·4% India (1905)
2. Germany (1925)=72·7% Germany (1905)
3. U. S. A. (1925)=77·3% U. S. A. (1905)
4. Italy (1925)=78·5% Italy (1905)
5. England and Wales (1925)=80·8% England & Wales (1905)
6. Russia (1925)=82·0% Russia (1905)
7. France (1925)=88·8% France (1905)
8. Japan (1925)=104·3% Japan (1905).

We are to understand that in India in 1925 the wastes from death are 70·4% of those in 1905, in Germany 72·7% and so on, and that in Japan they are 104·5%.

All the regions indicated above, with the exception of Japan, exhibit a decline in death-rate. Japan is the only region where death-rate is seen to be on the increase. The rates of diminution in death-rate are varied for the

4. *Annuaire Statistique 1928*, p. 23 ; *The Financial and Economic Annual of Japan 1926* (Tokyo) p. 3 ; *Compendio Statistico 1930* pp. 34-35.

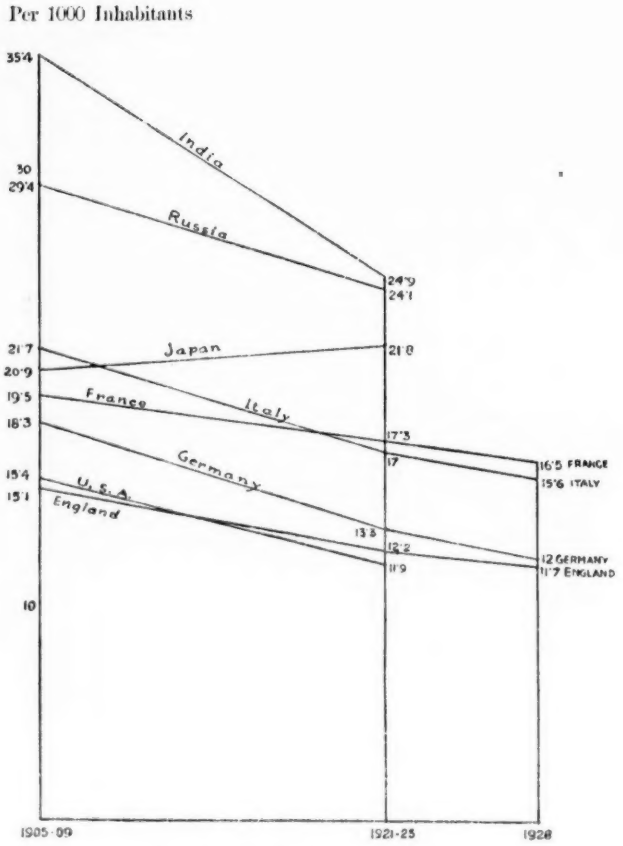

Chart III. Comparative Demography : Dynamics of the Death-rate.

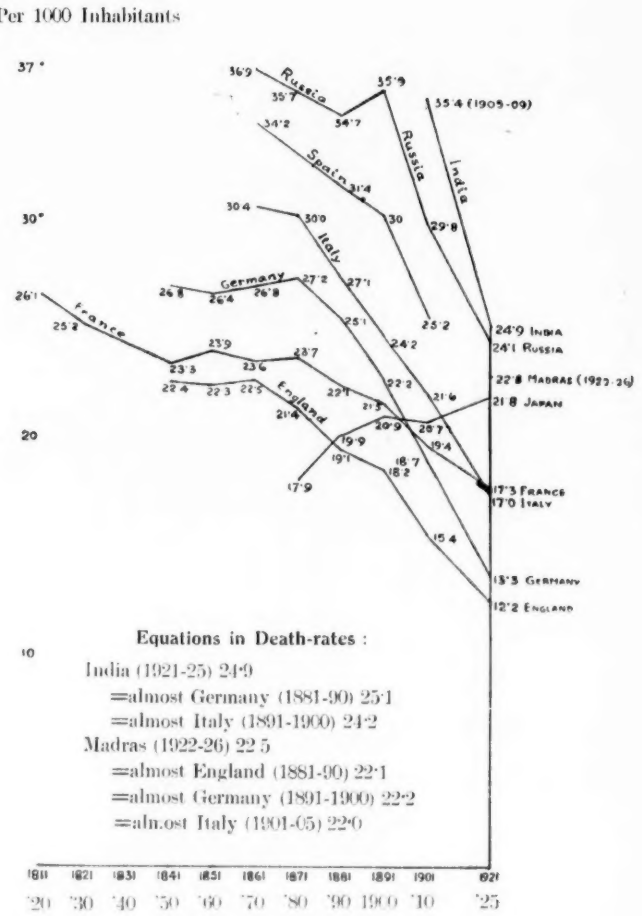

Chart IV. Comparative Demography : The Death-lines of Nations.

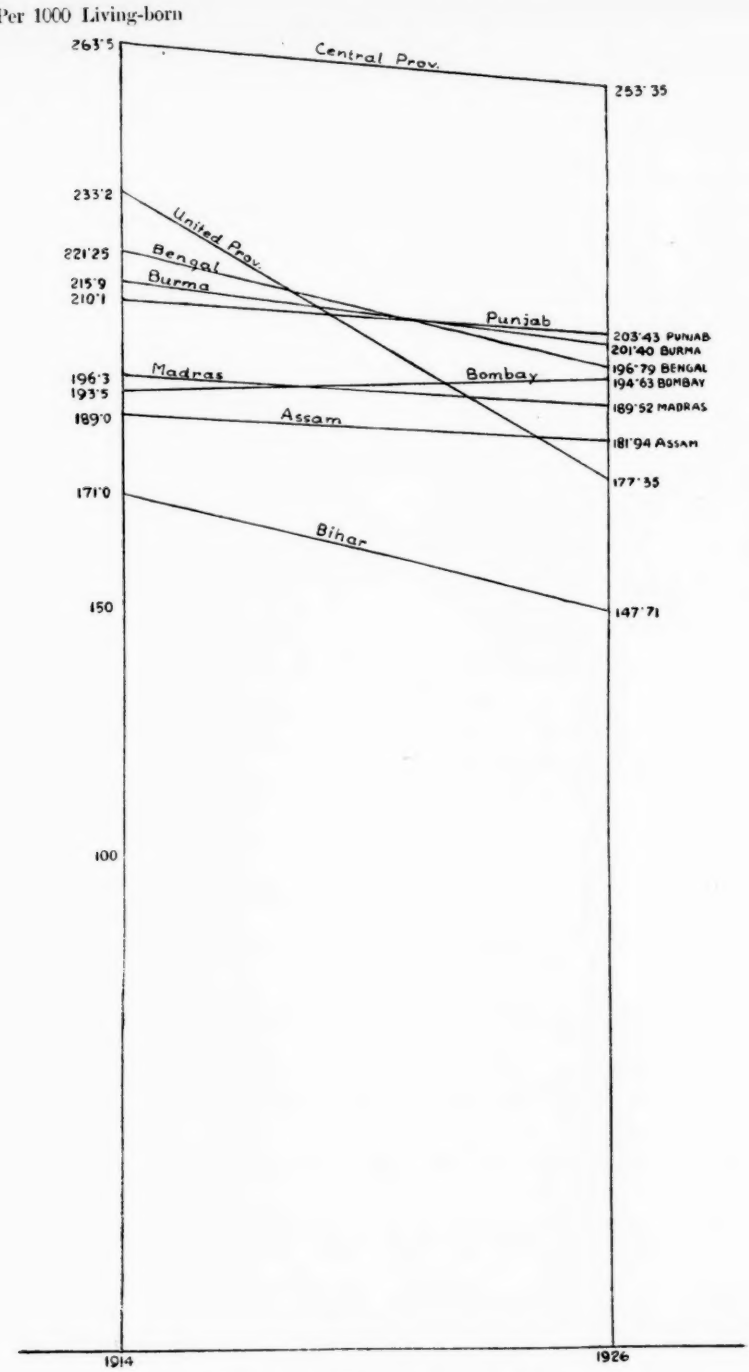

Chart V. Comparative Demography :
Dynamics of Infant Mortality in India.

different counties. The following schedule indicates the variations in the rate of diminution from 1905 to 1925 :

1.	India	29·6%
2.	Germany	27·3%
3.	U. S. A.	22·7%
4.	Italy	21·5%
5.	England and Wales	19·2%
6.	Russia	18·0%
7.	France	11·2%

This table as well as the chart (III) point out that the decline is the steepest in the case of India and that Germany follows India in the rate of decline. We notice also that although France and Germany exhibited nearly the same death coefficient in 1905-9 the progress in the latter country in regard to the diminution is much more pronounced than in the former. Italy's progress is quite mentionable. She has been able to beat France. England and Wales has not been able to keep pace with the U. S. A. and has indeed been beaten by the latter. The Japanese death-line is of course exceptional. The declining death-rate is like the declining birth-rate an almost universal phenomenon of modern times.

In so far as the declining death-rate by itself can be taken to be a factor in increasing efficiency it may be observed that there is undoubtedly an increase in the efficiency of the peoples in the seven regions under discussion. This increasing efficiency can be exhibited in the following equations :

1.	India (1925)	=1·29 India(1905)
2.	Germany (1925)	=1·27 Germany (1905)
3.	U. S. A. (1925)	=1·22 U. S. A. (1905)
4.	Italy (1925)	=1·21 Italy (1905)
5.	England and Wales (1925)	=1·19 England and Wales (1905)
6.	Russia (1925)	=1·18 Russia (1905)
7.	France (1925)	=1·11 France (1905)

In other words, India in 1925 is 1·29 times as efficient as herself in 1905, Germany 1·27 times and so on. These efficiency-equations indicate the relative position of each region at two different points or periods of time. In the case of Japan the efficiency line would be embodied in the following equation :

Japan (1925) =0·95 Japan (1905).

That is, Japanese efficiency in 1925 has slightly diminished in comparison with 1905, in so far as death statistics may be appropriately cited in evidence.

India's progress in the diminution of death-rate is palpable,—a decline of some ten points and more from 35·4 to 24·9 per 1000 inhabitants. And this can be appreciated adequately not by comparison with Germany whose death-rate was comparatively low (18·3) in 1905-09 but with Russia with a high death-rate (29·4). In Russia the decline is to be measured by 18·0% only whereas in India by 29·6%. But altogether it would appear that, comparatively speaking, the most noticeable decline in death-rare has taken place in Germany where even with a low death-rate the diminution has been as great as 27·3%. A contrast may here be made with France whose death-rate in 1905-09 was 19·5 just above Germany's 18·3. But in tweenty years the death-rate in France has declined to 17·3 *i.e.* only 11·2%.

Be this as it may, the percentual progress in the diminution (29·6%) of death-rate as well as in the increase of efficiency in which India happens to top the list *i.e.* to be superior to all the great powers should not mislead the statistician. We know that the absolute death-rate is still very high (24·9 for 1921-25, and 26·8 for 1926). Indeed it is the highest in the world and its economic significance from the standpoint of the comparative efficiency of nations has already been discussed in the previous section.

5. THE COMPARATIVE DEATH-LINES OF NATIONS (1811-1881-1928)).

The high death-rates of the Indian provinces, in other words, the coefficients of Groups I, II and III, were the prevalent death-rates of mankind until a few years ago. It is not long that these rates have disappeared from those regions that happen to find themselves in Groups IV and V today. A historical study of the death-lines of nations would establish the parity between them on a chronological basis. The difference between the regions on the

score of death-coefficients would turn out to be but a distance in point of time,—a relation of certein regions pioneering or going ahead and others following or catching up to the former.

The death-charts of certain regions are exhibited below from 1811 to 1910 (1928) : [5]

	France	England and Wales	Germany	Italy	Russia	Spain	Japan
1811-20	26·1	×	×	×	×	×	×
1821-30	25·2	×	×	×	×	×	×
1831-40	24·8	×	×	×	×	×	×
1841-50	23·3	22·4	26·8	×	×	×	×
1851-60	24·0	22·3	26·4	×	×	×	×
1861-70	23·7	22·5	26·8	30·4	36·9	34·2	×
1871-80	23·7	21·4	27·2	30·0	35·7	×	17·9
1881-90	22·1	19·2	25·1	27·1	34·7	31·4	19·9
1891-1900	21·5	18·2	22·3	24·2	35·9	30·0	20·9
1901-1910	19·4	15·4	18·7	21·6	29·8	25·2	20·7
1920	17·2	12·4	15·1	18·8	×	×	25·4
1922	17·6	12·9	14·4	17·7	×	×	×
							21·2 (1924)
1927	16·6	12·3	12·0	15·5	×	×	×
1928	16·5	11·7	12·0	15·6	×	×	×

A comparatively small area like Bavaria with some 5-6, 8 million inhabitants exhibited the coefficient above 30 between 1864 and 1883, above 25 down to 1900 and above 20 down to 1911. Down to 1883 Bavaria was in the same condition as the C. P. and the Punjab in 1922-26 and worse than the seven other provinces of India. Down to 1900 she was worse than Madras and Burma and comrade to Assam, Bombay, Bengal, Bihar and the U. P. of 1922-26.

In 1900 France (21·5 per 1000) which today finds herself in mortality-group IV (15-20 per 1000) would have her place in Group III where Madras, Rumania, Burma, and Bulgaria find themselves (1922-26, 27). As regards decline in death-rate France is thus about 25 yearis ahead of these regions. And in her historical statistics it is possible to place her in Group II (25-30 per 1000) as well, because down to 1830 her death-coefficient was above 25. That is, about a century ago France was in the same condition as Chile, or an average Indian province today. High mortality-rates are therefore as much French as South-American, Balkan, Slav, Indian etc.

From 1841 to 1880 England and Wales was exhibiting mortality rates between 22·4 and 21·4. Her place was all this time in Group III. She is thus about a generation and a half ahead of Madras, Rumania, Burma and Bulgaria.

The following historical equation in death statistics would precisely exhibit the comparative position with reference to France and England :

Madras (1922-26) 22·5=almost France (1881-90) 22·1
=England (1861-70) 22·5.

It is evident of course that England and Wales is ahead of France. Thus

France (1881-90) 22·1=almost England and Wales (1851-60) 22·3.

France was during this period some twenty years behind England and Wales so far as mortality conditions are concerned.

Down to 1890 Germany was in Group II (25-30 per 1000). She was at that time nearly two generations behind France as the following equation indicates :

Germany (1881-90) 25·1=France (1821-30) 25·2.

During 1861-70 Germany's coefficient 26·8 was the same as that of an average Indian province in 1926. During the next decade it rose to 27·2 and was therefore higher than the Indian coefficient of today. In 1881-1890 the Germany death-rate was higher than that of Madras (22·5) and Burma (20·97) in 1922-26. That is, Germany is ahead of Madras and Burma by nearly one generation. It is specially interesting to observe that Germany which with 12·0 finds herself in Group V in 1927 could not rise up to Group III before 1891-95 with 23.3 and to Group IV before 1901-1905 with 19·9. Germany's progress in the diminution of death rate has been late but rapid and in any case extraordinary. The chart (IV) exhibits how the German line abruptly cuts the French line in its downward march, and this

5. Woytinsky : *Die Welt in Zahlen* Vol. I. (Berlin. 1925), p. 101 ; *Financial and Economic Annual 1926*, p. 3. Woytinsky : *Tatsachen und Zahlen Europas* (Wien 1930), pp. 64-65. *Statistique Generale de la France, Annee 1877* pp. XXIV, XXVIII, XXXII, *Annee 1881*, pp. XXIV, XXVIII, XXXII ; *Compendio Statistico 1930*, p. 35. *Bayerns Entwicklung nach den Ergebnissen der amtlichen Statistik seit 1840* (Munich 1915) pp. 6-9.

between 1901 and 1910. Since 1924 the German line has been competing with the English line in the same direction.

We may now take Italy. Down to 1880 Italy's mortality-conditions were those of Group I (above 30 per 1000). Down to 1890 she was in Group II (25-30). With 27·1 she was indeed in a somewhat worse situation than Bihar and Orissa, Bengal, Bombay, Assam and Chile in 1922-26. She was in any case not more than about one generation ahead of these regions. From 1896 to 1910 she was in Group III as follows :

1896-1900	...	...	22·9 per 1000
1901-1905	...	...	22.0 ,, ,,
1906-1910	...	...	21·2 ,, ,,

Madras and Burma are thus behind Italy by not more then twenty to twenty fiive years. It is not before 1914 that Italy first reaches Group IV where she finds herself today and, as the Chart (IV) indicates, her death line has even gone lower than that in France.

Down to 1900 Spain was in Group I (above 30). Her place was in Group II (25-30) down to 1910. She is thus some fifteen to twenty years ahead of Bombay, Assam etc. It is not necessary to discuss Russia specially as she finds herself in Group III still and was in Group II down to 1910.

The mortality conditions of Japan are peculiar. The death-rate was on the increase from 1871 to 1910 although it is interesting that it was not very high. The death rate in 1924 is still higher than the average for 1871-1880, (17·9). The following figures are interesting from this standpoint :

1918	...	...	26·8
1920	...	...	25·4
1921	...	...	22·7
1924	...	...	21·2

Japan's present position may be envisaged as follows :

(1) Madras (1922-26) 22·5=almost Japan (1921-25) 21·8.

Madras and Japan are almost identical today, although canditions are somewhat more favourable in the latter country.

(2) Japan (1921-25) 21·8=England and Wales (1871-80) 21·4.

Japan is behind England by some fifty years.

(3) Japan (1921-25) 21·8=Germany (1891-1905) 23·3-19·9 =Italy (1906-1910) 21·2.

(4) Japan (1927) 19·8=almost Germany (1901-05) 19·9 =almost Italy (1911-14) 19·1.

Japan is behind Germany by some twentyfive and behind Italy by some fifteen years.

We shall now analyze the history of deaths in Norway, Sweden and Austria, three regions which in 1927 are in Group V, in order to find out at what dates they have been able to pass out of the worse conditions. The following table will tell the story : [6]

	Norway	Sweden	Austria
1801-10	25·2	27·9	—
1811-20	21·2	25·8	—
1821-30	18·9	23·6	—
1831-40	20·2	22·8	—
1841-50	18·1	20·6	—
1851-60	17·1	21·7	—
1861-70	18·0	20·2	30·8
1871-80	—	—	31·6
1881-90	—	—	29·5
1891-1900	—	—	26·6
1901-1910	—	—	23·3
1911-1916	—	—	20·1

Norway was in Group II with 25·2 in 1801-1810 and in Group III with 20·2 down to 1840. Among the recorded regions Norway happens to be chronologically the first to bid adieu to the mortality conditions of above 20 per 1000. Sweden was in Group II down to 1820 and in Group III down to 1870. She comes just after Norway in the betterment of death-rates.

Austria was in Group I down to 1880, in Group II down to 1900 and in Group III down to 1916. The following equations would illustrate the position :

Punjab (1922-26) 31·30=almost Austria (1871-80) 31·6
Bengal (1922-26) 26·3=almost Austria (1891-1900) 26·6
Burma (1922-26) 20·97=almost Austria (1911-26) 20·1

In comparison with Austria the chronological backwardness of Indian provinces (1922-26) in regard to mortality conditions can thus be precisely determined as follows : For the Punjab

6 Woytinsky : *Die Welt in Zahlen*, Vol. I. p. 101.

it is some 50 years, for Bengal some 30 years and for Burma (as well as Madras) some 10-15 years only.

Hungary's [7] case is also interesting from the standpoint of comparative death statistics. The figures down to 1910 are noted below :

1881-90	...	32·5
1891-1900	...	29·9
1901-1910	...	25·7

We obtain the following equations :

Central Provinces (1922-26) 32·74=almost Hungary (1881-90) 32·5.

The Central Provinces of India are about 40 years behind Hungary.

Down to 1910 Hungary is in Group II, *i.e.* in the same conditions as the U. P., Bihar and Orisa, Bengal, Bombay and Assam during 1922-26. These regions are then some 10-15 years behind Hungary. The conditions of Group III (20-25 per 1000) *i.e.* of regions like Madras and Burma are exhibited by Hungary even in recent years, for instance :

1911	...	25·0
1912	...	23·3
1913	...	23·5
1914	...	23·5
1915	...	25·7
1916	...	20·9
1917	...	20·7
1918	...	25·9
1920	...	21·2
1922	...	20·8
1924	...	20·3

It is only since 1925 that Hungary may be said to have found her steady place in Group IV (15-20 per 1000) ; thus :

1925	...	16·9
1926	...	16·5
1927	...	17·6
1928	...	17·1

6. India in International Death-Statistics.

A comparative and historical study of the mortality-indices as well as a survey of the equations of international death-statistics yield the following results .

1. The mortality-rates can be divided into five groups : (*a*) above 30 per thousand, (*b*) 25-30, (*c*) 20-25, (*d*) 15-20, (*e*) below 15. The first three, *i. e.* those with 20 and above may be described as "high" mortality groups, the one with 15-20 as "medium" and the last as "low" mortality group.

2. Europe or for that matter the "Western" world cannot be described as uniform in mortality index. There is no unity in Europe so far as death conditions are concerned. An alleged European death-rate does not exist. Nor is there an alleged Asian or even Indian death-rate.

3. No death-index can be described as typical or characteristic of any particular climatic region, race or religion.

4. Almost every community of human beings has been exhibiting a decline in the death-rate. Japan is an important exception.

5. The date at which the death-line of a region goes below the 20 per thousand point *i.e.* at which the region rises up to Group IV, may be regarded as important in the history of its vital statistics.

6. This date is different for different regions, thus

c	1840	for	Norway
c	1870	„	Denmark
c	1870	„	Sweden
c	1881-90	„	England and Wales
c	1881-90	„	Switzerland
c	1891-1900	„	Holland
c	1891-1900	„	Belgium
c	1901-1905	„	Germany
c	1901-10	„	France
c	1911-16	„	Austria
c	1916	„	Italy
c	1924	„	Hungary

7. The differences between one European region and another European region are tremendous. Denmark and Sweden cross the 20-Index frontier thirty years, and England some forty to fifty years after Norway, the pioneer. The frontier is crossed by Germany and France almost simultaneously some twenty years after England.

7. Woytinsky : *Tatsachen und Zahlen Europas*, p. 64.

8. The decade 1881-90 may be regardad as the turning point in the death-history of Europe, (1) because it is during this epoch that a continental region, Switzerland, as well as England and Wales for the first time enter Group IV (15-20 per 1000), (2) because they are quickly followed by others during the next decades, *e.g.* Holland and Belgium (1891-1900), France and Germany (1901-10), and so on, and (3) because the pioneering achievements of the Scandinavian regions may be regarded as rather too early and exceptional for the general run of Europe.

9. Improvement in the death-index is therefore today a fact of not more than a generation and a half.

10. The pioneers in this betterment of death-conditions are not ahead of the backwards of today by more than 15, 20, 30, 45 or 50 years.

11. Germany has caught up to and gone beyond France and has almost caught up to England in a marvellous manner.

12. Italy's progress is noticeable but is more recent than Germany's.

13. India's death-rate has also been declining. It came down to 24·9 in 1921-25 from 35·4 in 1905-09. The rate of progress in the diminution is indeed higher in the case of India than in that of other countries.

14. As for the actual death-rates in India the chronological distance from the go-ahead regions is different for the different provinces : it being understood of course that the go-aheads themselves are different from one another.

(1) Bengal (1922-26) 26·3
=Germany (1871-1890) 27·2—25 1

Bengal is in mortality-conditions about one generation behind Germany. This can be asserted about the average Indian province also whose mortality condition (26·8) is almost the same as Bengal's. Another equation

India (1921-25) 24·9
=almost Germany (1881-90) 25·1

tells almost the same tale.

(2) Burma (1922.26) 20·97
=almost Italy (1906-10) 21·2

Burma is behind Italy by some fifteen years.

(3) India (1921-25) 24·9
=almost Italy (1891-95) 25 5

An average Indian province is behind Italian mortality-conditions by some thirty years.

15. In a general way it may be asserted that the mortality-conditions on the Indian sub-continent are the same as those prevailing in Germany as well as Italy some 30 to 35 years ago.

16. We have noticed in a previous section that in birth-index the average Indian province is only some 20 years behind Germany and that certain provinces actually exhibit Italian conditions. We come to the conclusion therefore that in India modernism has progressed slower in mortality-index than in birth-index.

7. THE INFANT MORTALITY-INDICES OF NATIONS.

The number of infants (living born) dying within the first year of their birth is an important factor in the mortality statistics of a region. We shall, therefore, place here the facts bearing on the infant mortality-conditions in India. As in regard to other demographic phenomena and socio-economic facts, so in regard to this item also there is no uniformity in the Indian world. We have to examine the problem region by region as in the case of the European sub-continent or the American continent. The nine Indian provinces may be grouped for 1926 in the following manner according to the number of infantile deaths [8] within one year per 1000 live-births.

I. Above 200 per 1000.

1.	Central Provinces	... 253·38 (204·44 in 1925)
2.	Punjab	... 203·43 (187·71)
3.	Burma	... 201·40 (188·99)

II. Between 150 and 200 per 1000.

1.	Bengal	... 196·79 (179·05)
2	Bombay	... 194·63 (162·01)
3.	Madras	... 189·52 (180·94)
4.	Assam	... 181·94 (174·35)
5.	United Provinces	... 177·35 (175·51)

8. *Annual Report etc. 1926* (Calcutta 1928), p. 12.

III. Between 100 and 150 per 1000.

1. Bihar and Orissa ... 147·71 (137·6)

The year 1926 was worse than 1925. The Punjab would have been in Group II during the previous year. Otherwise there would have been no alteration in the grouping. In Group II the provinces would have changed places. It is clear however that there is a difference of more than 100 points in 1926 or some 75 points in 1925 between the Central Provinces and Bihar. The range is extensive and all the rates are very high. Even the lowest 147·7 or 137·6 (Bihar) is not moderate. The average for all India is 174·40 for 1925 and 189·04 for 1926.

We shall now place the Indian coefficients in the perspective of the international infant mortality rates [9] as follows :

I. Above 200 per 1000 live-births.

1.	Central Provinces (India)	...	253·38 (1926)
2.	Chile	...	251·0 (1926)
3.	Punjab (India)	...	203·43 (1926)
4.	Burma (India)	...	201·40 (1926)
5.	Rumania	...	201·0 (1924)

II. Between 150 and 200 per 1000 live-births.

1.	Bengal (India)	...	196·79 (1926)
2.	Bombay (India)	..	194·63 (1926)
3.	Madras (India)	...	189·52 (1926)
4.	India	...	189·04 (1926)
5.	Hungary	...	185·0 (1927)
6.	Assam (India)	...	181·94 (1926)
7.	United Provinces (India)	...	177·35 (1926)
8.	Egypt	...	155·0 (1925)
9.	Tchechoslovakia	...	154·0 (1927)
10.	Lithuania	...	152·0 (1927)
11.	Bulgaria	...	150·0 (1924)

III. Between 100 and 150 per 1000 live-births.

1.	Ukrainia	...	148 (1927)
2.	Bihar and Orissa (India)	...	147·71 (1926)
3.	Japan	...	137 (1926)
4.	Spain	...	127 (1227)
5.	Austria	...	123 (1926)
6.	Italy	...	119 (1925)
7.	Canada	...	103 (1926)

IV. Under 100 per 1000 live-births.

1.	Belgium	...	97 (1926)
2.	Germany	...	97 (1927)
3.	France	...	83 (1927)
4.	United States	...	72 (1925)
5.	England and Wales	...	69 (1927)
6.	South Africa	...	63 (1926)
7.	Holland	...	59 (1927)
8.	Switzerland	...	57 (1926)
9.	Sweden	...	57 (1926)
10.	Australia	...	54 (1927)
11.	Norway	...	50 (1924)
12.	New Zealand	...	38 (1927)

9. *Statistisches Jahrbuch fuer das Deutsche Reich* 1928, *Internationale Uebersichten* p. 13*; *Compendio Statistico, 1930*, pp 39, 42.

The coefficients of I and II may be regarded as "high", those of III "medium" and those of IV "low". None of the Indian provinces possess the "low" coefficient. There is only one, Bihar and Orissa, in the "medium" group. All the others are in the two "high" groups. The Indian average 189·04 is "high". Japan, a "great power," finds herself in the same group as Bihar. So also does Italy, another "great power." Ukrainia, Spain and Austria in Europe as well as Canada in America are comrades of Bihar and Orissa in the medium-index. As for the high-index groups Hungary is an intimate neighbour to Madras and Assam, while Tchechoslovakia, Lithuania and Bulgaria happen to be somewhat distant comrades of the United Provinces. Rumania with 201·0 is a near comrade of Burma and the Punjab while Chile in South America and the Central Provinces of India find themselves at the top and almost on the same level (above 250). It will be noticed that both in general mortality as well as in infant mortality conditions the Central Provinces and the Punjab are the worst in India as well as in the world. To the same category belong Chile in South America and Rumania in Europe. It is to be observed incidentally once more that there is hardly anything in common between these regions so far as climate, race, religion etc. are concerned.

To understand the conditions of socio-economic efficiency and welfare we shall institute here a number of comparisons between the different regions. Let us take Bihar and Orissa (147·71), the best region in India. It is superior to Chile, Rumania, Hungary, Egypt, Tchechoslovakia, Lithuania and Bulgaria. The follow-

ing equations will place Bihar in the international scale :

Bihar (147·71)=1·52 Germany or Belgium (97)
=almost 2 U.S A. (72).

Let us take Bengal, which is superior only to Chile and Rumania, and we find :

Bengal (196·79)
=1·65 Italy (119)
=almost 2 Germany or Belgium (97)
=2·85 England (69)

The Indian average (189·04) is likewise just superior to Chile's and Rumania's and near about Hungary's (185·0). The equations for entire India are given below :

India (189·04)
=1·38 Japan (137)
=1·58 Italy (119)
=1·898 Germany or Belgium (97).

Some of the other regions may likewise be measured in terms of one another,—thus

Japan (137)=1·4 Germany or Belgium (97)
=almost 2 England (69)
Italy (119) =1·2 Germany or Belgium (97)
=1·7 England (69)
Germany (97) =1·4 England (69)
=2·5 New Zealand (38)
England (69) =1·8 New Zealand (38).

The wastes from infant mortality in Bihar are 1·52 times those in Germany, and those in Germany 1·4 times those in England. Bengal's recklessness in the same regard is double that of Germany or Belgium and 2·85 times that of England. Japan's wastes are almost twice and Italy's 1·7 times those of England. Compared to New Zealand Germany is 2·5 times wasteful and England 1·8 times.

8. INDIA'S INFANT MORTALITY-COEFFICIENTS IN THE LIGHT OF HISTORICAL STATISTICS.

Like the other demographic indices, the infant mortality-index also is dynamic. And it is possible to notice changes in the rates in India, for instance, from 1914 to 1926. (10) We shall take the nine Indian Provinces in the alphabetical order and follow the variations in regard to annual deaths of infants under one year for every 1000 live-births. The differences between males and females will also be indicated. The following table will enable us to grasp the situation :—

	1914			1926		
	m.	f.	Total average.	m.	f.	Total average.
1. Assam ...	200·32	177·84	189 0	192·99	170·17	181·94
2. Bengal ...	227·28	215·22	221·25	202·7	190·4	196·79
3. Bihar and Orissa ...	177·71	164·43	171·0	158·28	136 68	147·71
4. Bombay ...	201·86	185·15	193·5	203·41	185·14	194·63
5. Burma	229·53	202·35	215·9	210 98	191·41	201·40
6. Central Provinces...	281·89	245·11	263·5	271·54	234·38	253·35
7. Madras ...	206·35	186·27	196·3	198·77	179·94	189·52
8. Punjab ...	208·98	211·38	210·0	206·30	200·23	203·43
9. United Provinces ...	238·15	228·39	233·2	183·35	170·62	177·35

There has been a diminution in the rate in all the provinces except only in Bombay where it has remained almost stationary, rather has increased (from 193·5 to 194·63). The improvement during 10 or 12 years is altogether rather slight, the greatest being noticeable in the United Provinces (from 233·2 to 177·35) and in Bengal (from 221·25 to 196·79). The fall in the rate in the case of Bihar and Orissa (from 171 to 147·71) is parallel to that in Bengal, as the chart V will reveal.

Infant mortality indices in India are high. These high rates, however, are not unknown in the historical statistics of other countries. Take the Indian average for 1925 which is 174·40, or that for 1926 which is 189·04. Let us compare the relations with France which in 1927 has as low an index as 85. Thus for the period 1925-1927 we get the following equations :

India (1925) 174·40=2·1 France (1927) 83.

But in the population history of France we get such high figures of infant mortality as the following during 1872-80 : (11)

(10) *Statistical Abstract for British India 1914-1924*, (Calcutta 1925), p.p. 372, 377, *1917-27* (Calcutta 1928), 374, 379.

(11) *Statistique Generale de la France, Annee 1877*, p. xxxiii, *Annee 1881*. p. xxxiii.

1872-76	...	...	192·2
1878	...	...	162·0
1880	...	...	180·0
1881	...	...	165·0
1876-80	...	...	166·0.

Historically, then, the following equation is noteworthy :

India (1925) 174·41=almost France (1880) 180·0.

That is, in 1925 India is in a little bit better condition than France in 1880. The chronological distance between France and the Indian sub-continent is some 45 years. We may take a smaller area, say, Bengal, and can get the following equation :

Bengal (1925) 179·05=almost France (1880) 180·0.

It is by a generation and a half that Bengal is backward in comparison with France so far as infant mortality conditions are concerned. In other words, it is only in recent years that the infant-mortality index has gone down in France. In regard to England and Wales as well as Germany, too, the improvement in infant mortality conditions is likewise a comparatively recent phenomenon.

The high rates of infant mortality for males and females that we have tabulated for the Indian provinces for 1914 and 1926 will be found to have been anticipated in certain regions of Europe during previous decades. The following table will give some of the European indices : (12)

		1876-1885	1896-1905	1909	1913	1914	1915
Russia :	m.	269	275	265	—	—	—
	f.	238	242	228	—	—	—
France :	m.	180	162	—	123	—	—
	f.	152	135	—	102	—	—
Italy :	m.	212	176	—	—	137	—
	f.	192	159	—	—	123	—
England and	m.	155	161	—	—	—	123
Wales	f.	127	132	—	—	—	96
Germany	m.	221	211	—	—	177	—
	f.	190	179	—	—	149	—

Let us place the total (male and female) infant mortality indices of these nations in a chronological series and we get the following table (chart VI) :

(12) Woytinsky : *Die Welt in Zahlen*, Vol. I. (1925), p. 82.

	1876-85	1896-1905	1909	1913	1914	1915
Russia ...	253·5	258·5	246·5	—	—	—
France ...	166·0	148·5	—	112·5	—	—
Italy ...	202·0	167·5	—	—	130	—
England and Wales	141·0	146·5	—	—	—	109·3
Germany ...	205·4	195·0	—	—	168	—

Down to 1885 both Italy and Germany were in Group I *i. e.* possessed the infant-mortality index above 200. The following equations elucidate the position :

Punjab (1926) 203·43=almost Germany (1876-85) 205·5
Burma (1926) 201·40=almost Italy (1876-85) 202·0

During 1876-85 every year more than 200 infants per 1000 living born used to die within one year both in Germany and Italy. These two countries were thus in exactly the same condition as prevailed in the Punjab and Burma in 1926. Down to 1909 Russia was also in Group I. Her condition was that of the Central Provinces in 1926.

A few more equations will serve to establish the chronological distance in an effective manner, thus

Bengal (1926) 196·79=almost Germany (1896-1905) 195·0

In 1926 Bengal was nearly twenty to twenty-five years behind Germany in the improvement of infant mortality conditions. Towards the beginning of the twentieth century Germany was as wasteful in infants as Bengal about a quarter of a century later. The following equation is also interesting :

Bihar (1926) 147·71=almost France (1896-1905) 148·5

From the standpoint of infant mortality Bihar and Orissa happens to be the best region in India. And in comparative vital statistics her position in 1926 is just a little better than that of France about two decades previous to this date. The best in India is thus not behind one of the best in Europe by more than twenty or twenty-five years. This is Bihar's relation to England and Wales also, for

Bihar (1926) 147·71=England and Wales (1896-1905) 146·65

In comparison with Germany Bihar's position is much more favourable, because infant mortality in Germany was exhibiting a high index, higher than Bihar's, down to the beginning of the Great War.

We may go into details about male and female infants and take the case of Bombay comparing her statistics with those of Germany and Italy. The following equation tells its own story :

Bombay (1926) m. 203·41, f. 185·14
=Germany (1896-1905) m. 211, f. 179
=Italy (1876-85) m. 212, f. 192

During 1896-1905 male infants 211 in number and female infants 179 in number among 1000 living born were dying in Germany every year within the first year of their birth. And in Italy during 1876-85, 212 male infants and 192 female infants used to die in the first year of their birth. In 1926 more or less the same conditions prevailed in Bombay. The advance of Germany upon Bombay is to be measured by some twentyfive and that of Italy by some forty five years. It is evident also that Germany was for a long time behind Italy. It is only in post-war times that Germany has been able to catch up to and go beyond Italy in the improvement of infant mortality conditions.

How high the infant mortality indices have been in Europe will be apparent from the statistical history of an advanced German territory, say, Bavaria, from 1840 to 1911.[13] During this period the population of this area rose from 4,370,977 to 6,887,291. It is interesting to observe that during this entire period the kingdom of Bavaria was in Group I, i. e. more than 200 infants used to die every year during the first year of their birth per 1000 living-born. The following figures are illuminating :

1839-40	299	1883	293
1840-41	300	1886	295
1841-42	318	1891	274
1845-46	318	1895	278
1850-51	304	1897	264
1852-53	311	1899	251
1856-57	328	1900	278
1858-59	351	1903	250
1860-61	347	1905	241
1864-65	351	1907	220
1866-67	331	1909	217
1871	343	1910	202
1875	319	1911	223
1877	300	1912	177
1881	284	1913	182

(13) *Bayerns Entwicklung nach den Ergebnissen der amtlichen Statistik seit 1840* (Munich 1915), p. 14.

The table shows that the index was above 300 down to 1877, above 250 down to 1903 and above 200 down to 1911. Bavaria's condition (1840-1903) was thus worse than that of any of the regions of India in 1925-26. Even the Central Provinces, the worst in India were in 1926 but twenty three years and in 1925 some ten years behind Bavaria. Even in 1911 Bavaria's index was higher than that of Bengal, Bombay, Madras, Assam, the U. P. and Bihar. Even in 1923 Bavaria's index 182 was identical with that of Assam (181·94) in 1926 and worse than that of the U. P. and Bihar of the same date.

9. Chronological Distances in Infant Mortality.

Let us now summarize certain general observations in regard to the comparative position of the different regions of the world so far as infant mortality is concerned, namely, the following :

1. Infant mortality indices in India are high and medium at the present moment (1926).
2. The Indian indices have gone down, on the whole, although slightly, from 1914 to 1926.
3. The high and medium infant mortality indices of 1926 are not characteristic in any sense of Indian climate, race or religion. They are prevailing in non-Indian and non-Asian regions also at the present moment ; and it is only in very recent years that they have disappeared from some of those regions.
4. The steady decline in infant mortality begins in England during 1896-1905, but in France, Italy and Germany during 1876-1885 (chart VI).
5. The Punjab and Burma infant mortality rates of 1926,—*i. e.* the highest Indian indices,—prevailed in Germany and Italy down to 1885.
6. The Bengal and Bombay rates of 1926 prevailed in Germany down to 1905.

7. The Indian average of 1926 (189·04) or the Madras rate of 1925 is lower than the German index of 1896-1905 (195·0).

8. The Indian average of 1925 (174·40) is lower than the French index of 1880 (180·0), which is almost approached by the Assam index of 1926 (181·94).

9. The Bihar index of 1926 (147·71) is a little higher than the British index of 1896-1905 and a little lower than the French index of the same decade. The Bihar index of 1925 (137·6) is much lower than the German index of 1914 (168).

10. Altogether, in infant mortality index the Indian sub-continent exhibits conditions which may be placed in England, France, Itlay and Germany somewhere between 1880 and 1914. The average Indian province of 1925-26 is indeed in the German condition of 1905-14.

III. GROWTH-RATES.

1. Rate of Growth in India by the World-Standard.

We are now in a position to examine the annual excess of live-births over deaths per thousand inhabitants, *i. e.* the rate of growth or "natural increase" of population. For the period 1922-26 the Indian provinces may be placed in the following groups : [1]

I. Between 5 and 10 per 1,000 per year.

1.	Punjab	9·49
2.	Madras	9·2
3.	Bombay	8·81
4.	Central Provinces ...	8·74
5.	Bihar and Orissa ...	8·7
6.	Burma	7·39
7.	United Provinces ...	5·81

II. Up to 5 per 1,000 per year.

1.	Assam	4·07
2.	Bengal	2·6

(1) *Annual Report of the Public Health Commissioner with the Government of India for 1926,* Vol. I. (Calcutta 1921), p. 9.

The rate of growth does not exceed 10 per thousand per year even for the provinces exhibiting the highest coefficients, namely, the Punjab (9·49) and Madras (9·2). For entire India the average is 6·82.

How low the rates of growth in India are, will be evident if they are placed in the international perspective. The growth-rates of the different countries of the world for 1927 are tabulated below [2] and in their midst are intercalated the Indian figures for 1922-26. We get the following groups :

I. Growth-Index above 15.

1.	Russia	21·0
2.	Egypt	18·2
3.	Argentina	17·5
4.	Chile	16·2
5.	Japan	15·2

II. Growth-Index between 10 and 15.

1.	Poland	14·2
2.	Canada	13·5
3.	Holland	12·8
4.	Bulgaria	12·7
5.	Portugal	12·7
6.	Australia	12·2
7.	Lithuania	12·1
8.	Rumania	11·9
9.	New Zealand	11·8
10.	Italy	11·2

III. Growth-Index between 5 and 10.

1.	Spain	9·7
2.	Punjab (India)... ...	9·49
3.	Madras „	9·2
4.	Bombay „	8·81
5.	Central Provinces (India)...	8·74
6.	Bihar and Orissa „ ...	8·7
7.	U. S. A.	8·4
8.	Denmark	8·0
9.	Hungary	7·6
10.	Burma (India)... ...	7·39
11.	Tchechoslovakia ...	7·3
12.	Norway	7·2
13.	British India	6·82
14.	Germany	6·3
15.	United Provinces (India) ...	5·81
16.	Switzerland	5·1

(2) *Annuaire Statistique International 1928* (Geneve), p. 23 ; *Annuario Statistico Italiano 1930* (Rome), p. 29 ; *Statistisches Jahrbuch fuer das Deutsche Reich 1928-30* (Berlin), *Internationale Uebersichten.*

Equations in Infant Mortality :

India (1926) 189·04=Germany between 1896-1905 (195·0) and 1909-15 (168)

Bengal (1926) 196·79=almost Germany (1896-1905) 195

Bihar (1926) 147·71=almost France (1896-1905) 148·5

=almost England (1896-1905) 146·65

Per 1000 Living-born

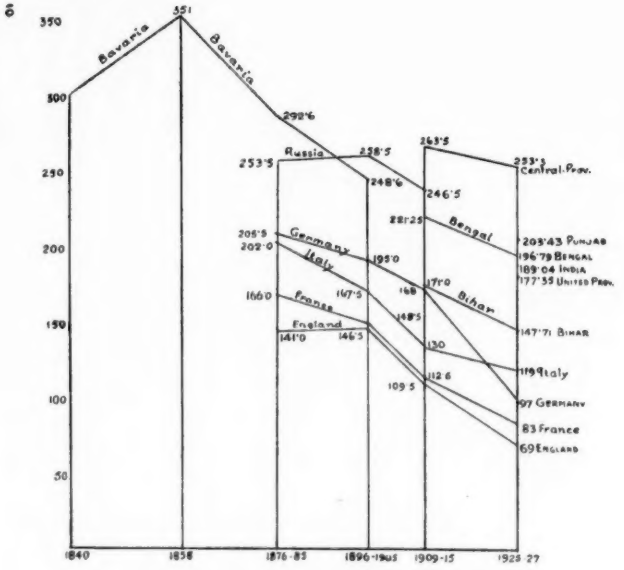

Chart VI. Comparative Demography : The Infant Mortality Lines of Nations.

Per 1000 Inhabitants

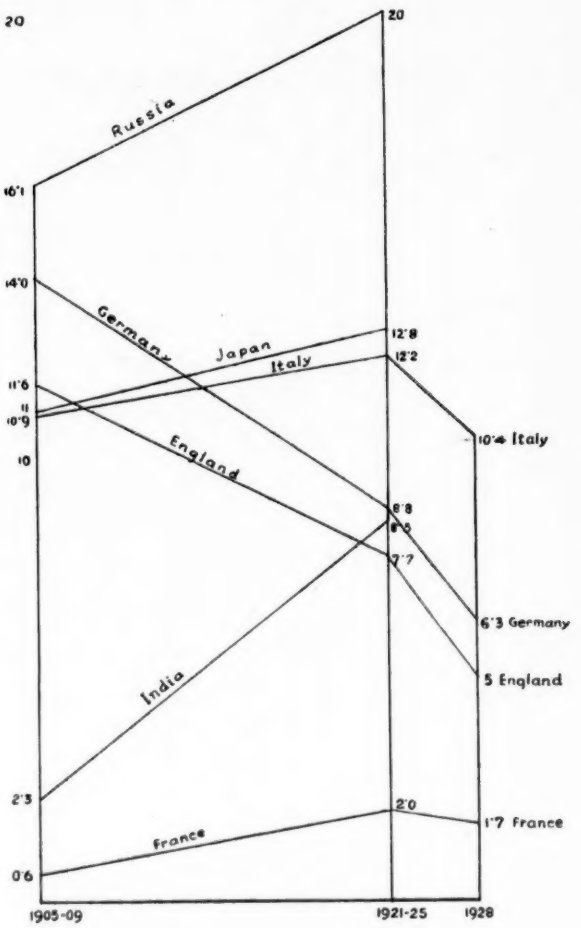

Chart VII. Comparative Demography : Dynamics of the Growth-rate.

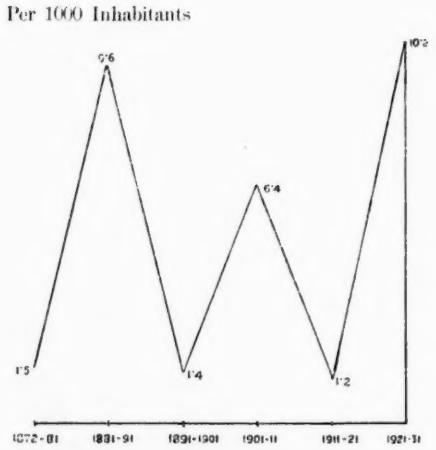

Chart VIII. Comparative Demography : Dynamics of Growth-rate in India (1872-1931)

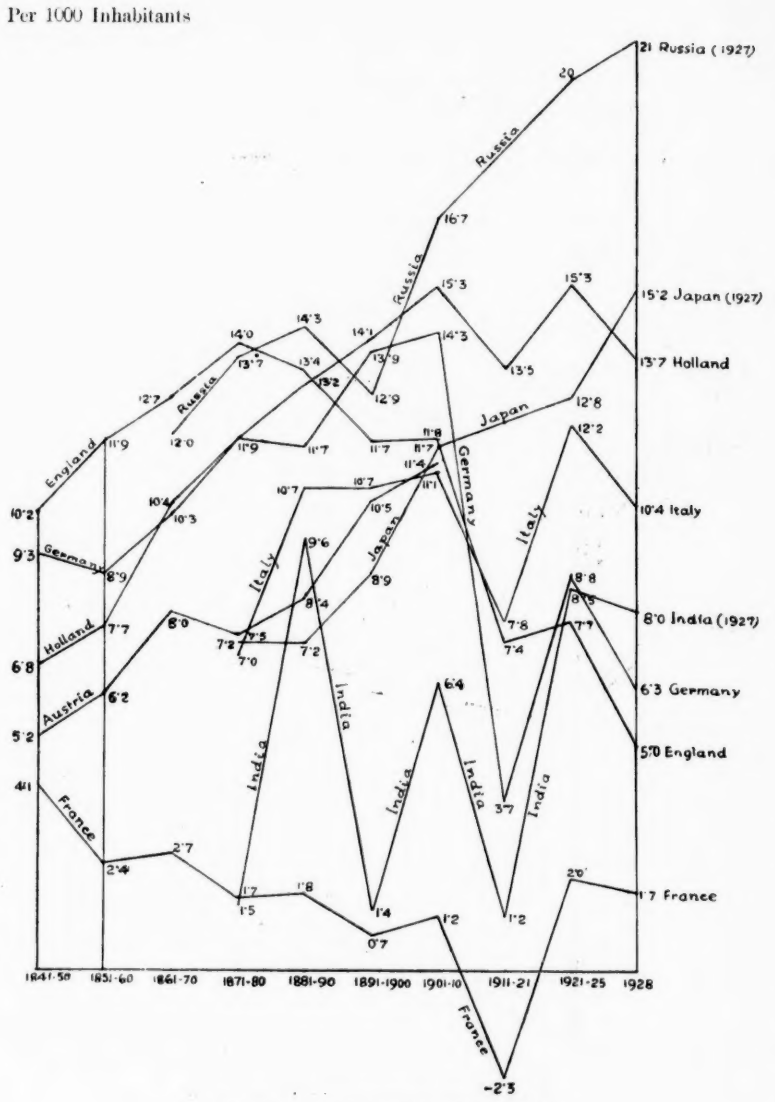

Chart IX. Comparative Demography : The Growth-lines of Nations. (The lines for Russia and Japan are incomplete at 1911-21)

IV. Growth-Index below 5

1.	Belgium	4·8
2.	England and Wales ...	4·5
3.	Assam (India)... ...	4·07
4.	Sweden	3·4
5.	Austria	2·9
6.	Bengal (India)... ...	3·6
7.	France	1·6

I and II may be regarded as "high" index groups, III "medium" and IV "low" index groups.

None of the provinces of India belong to the groups with higher growth-indices. The following equations would serve to indicate the difference in growth-rates between some of the members of the higher groups and the Indian provinces :—

Russia (21)=2·2 Punjab (9·49)
=3·6 United Provinces (5·81)
=8 Bengal (2·6)
Japan (15·2)=1·65 Madras (9·2)
=3·7 Assam (4·07)
=5·8 Bengal (2·6)
Holland (12·8)=1·45 Bombay (8·81)
Italy (11·2)=4·3 Bengal (2·6)

In other words, in 1927 Russia is multiplying 2·2 times as fast as the Punjab, 3·6 times as fast as the United Provinces and 8 times as fast as Bengal in 1922-26. Japan is multiplying 5·8 times as fast and Italy 4·3 times as fast as Bengal. In world-economy it is evidently not from the Indian quarter that over-population is to be feared, so far as the actual statistics of today are concerned.

2. Overpopulation and Poverty in World-Economy.

How little India is likely to contribute to a possible overpopulation of the world may be gathered in a rather precise manner, namely, by calculating the number of years necessary for the Indian people to double itself at the present rate of growth (6·82) per year. And here, again, as in regard to other items of economics, it would be instructive to compare the number of years to be taken by other peoples to double themselves at their present rates. This number is obtained by dividing 693 by the index of growth in each instance. We then get the following groups of nations on the basis of the comparative indices tabulated above (The population of each country is likewise indicated to show the volume of the mass affected by the doubling) :

I. Less than 50 years required for the population to double itself.

1.	Russia ...	33 years	(147 millions,	1926)
2.	Egypt	38 „	(14·1 „	1927)
3.	Argentina ...	39·6 „	(10·9 „	1928)
4.	Chile	42·7 „	(3·7 „	1919)
5.	Japan	45·5 „	(59·7 „	1925)
6.	Poland	48·8 „	(27·2 „	1921)

II. Between 50 and 75 years.

1.	Canada	51·3 years	(8·7 millions,	1921)
2.	Holland ...	54·1 „	(6·9 „	1920)
3	Bulgaria ...	54·5 „	(4·8 „	1920)
4.	Portugal... ...	54·5 „	(6·0 „	1920)
5.	Australia ...	56·8 „	(5·4 „	1921)
6.	Lithuania ...	57·4 „	—	
7.	Rumania ...	58·2 „	(16·3 „	1920)
8.	New Zealand ...	58·7 „	—	
9.	Italy	61·9 „	(38·7 „	1921)
10	Spain	71·4 „	(21·3 „	1920)
11.	Punjab (India) ...	73·0 „	(20·6 „	1921)

III. Between 75 and 100 years.

1.	Madras (India) ...	75·3 years	(42·3 millions,	1921)
2.	Bombay „ ...	78·6 „	(19·3 „	1921)
3.	Central Prov. (India)	79·2 „	(13·9 „	1921)
4.	Bihar & Orissa (Ind.)	79·6 „	(33·9 „	1921)
5.	U. S. A.	82·5 „	(105·7 „	1920)
6.	Denmark ...	86·6 „	(3·3 „	1920)
7.	Hungary ...	91·1 „	(8·0 „	1920)
8.	Burma (India) ...	93·6 „	(13·2 „	1921)
9.	Tchechoslovakia ...	94·9 „	(13·6 „	1921)
10	Norway	96·2 „	(2·6 „	1920)

IV. Between 100 and 150 years.

1.	British India ...	101·6 years	(242·8 millions,	1921)
2.	Germany ...	110·0 „	(62·4 „	1925)
3.	United Prov. (India)	119·2 „	(13·9 „	1921)
4.	Switzerland ...	135·8 „	(3·8 „	1920)
5.	Belgium ...	144·3 „	(7·4 „	1920)

V. Between 150 and 200 years.

1.	England & Wales ...	161·1 years	(37·8 millions,	1921)
2.	Assam (India) ...	170·2 „	(7·5 „	1921)

VI. Between 200 and 275 years.

1.	Sweden	203·8 years	(5·9 millions,	1920)
2.	Austria	238·9 „	(6·4 „	1920)
3.	Bengal	266·5 „	(46·6 „	1921)

VII. More than 425 years.

	France	433·1 years	(40·7 „	1926)

The above grouping indicates that most of the peoples of the world are likely to double themselves in shorter periods than those of India. The number of peoples likely to take longer periods than India is 7 and their total strength is 164·4 millions only. The 6 regions in group I numbering 262·6 millions are likely to double themselves in less than half a century. None of them are Indian. Something above 100 millions inhabiting the non-Indian regions included in group II are likely to double themselves in 50-75 years, and nearly 133·2 millions of the non-Indian regions in group III in 75-100 years.

At the present rate of natural growth the population of India will take 101·6 years to double itself. It is thus a question of something over a full century. A little more is likely to be taken by Germany, namely 110 years. But for all practical purposes the period of doubling may be taken to be the same for Germany and British India.

It is to be observed that the population of the nine provinces of British India considered in this monograph is 242·8 millions. We understand, therefore, that some 495·8 millions of the non-Indian peoples of the world as indicated in I, II, and III are likely to double themselves in shorter periods than the peoples of India who constitute numerically 48·9% of the former. If the world is in danger of being overpopulated in any special sense that danger is, therefore, likely to come more from elsewhere than from India.

A word may be said here on the question of overpopulation such as might affect the entire world or only some parts of it. Overpopulation is a rather vague category of economics and social science because, strictly speaking, overpopulation is but another name for poverty, *i. e.* a small income per head or a low standard of living and efficiency. Wherever there is poverty, there is overpopulation. A region that is marked by poverty and furnishes its people with a low standard of living and efficiency may be regarded as having crossed its optimum density *i. e.* as being already overpopulated. If it choses to popularize greater doses of poverty among its inhabitants and lower the standard of living and efficiency per head of population it may afford to possess more people and thus extend its overpopulation further. Should it be possible for it on the contrary to develop the economic resources and add to its total wealth and income to such an extent in the near future that the standard of living and efficiency per head may rise higher, *i. e.* its poverty may relatively diminish, the region may be congratulated on having counteracted the existing overpopulation. Economically speaking, everything depends on the exact contents of relative or absolute poverty, or what is the same thing, on the different items in the standard of living and efficiency that are to be counted while discussing wealth and welfare in the individual or collective sense. Poverty is, besides, very often more a "class" or "group" phenomenon than a "national" one and may to a certain extent be remedied by a more equitable distribution of the total national dividend. As long as poverty and standard of living happen to remain indefinite and variable categories the discussion of overpopulation is likely to be characterized by inexactness and questions of local and racial manners, habits, sentiments; nourishment longevity etc.

One thing, however, is clear. In regard to the problem of combating poverty or raising the standard of living and efficiency per capita there cannot be any doubt that it is a fundamental and universal question in world-economy. Every region on the surface of the earth has reasons to be careful enough to adopt proper and effective measures. In other words, every people, no matter how rich, is in need of vigorous efforts to check overpopulation in its own sphere. And although India is likely to be less a danger to the world from the standpoint of growth-index than other countries she will have to cultivate no less anxiety in order to combat poverty and therefore overpopulation within her own borders. Indeed the control of poverty, the development and expansion of national economic power and the heightening of per capita income are problems of more vital importance to India than to many

other regions. Overpopulation, then, is to be treated generally as an actual and eventual phenomenon of the entire human race. But in each region today the problem is special, relative and varied depending as it does on the different doses of poverty to which its inhabitants are used, class by class. And this special, relative or local character of overpopulation is likely to remain a fact of economic developments in the future; because it is very doubtful if the extent or content of poverty is likely ever to be uniform in the different regions or classes of people in the world.

3. EQUATIONS IN GROWTH *vs.* EQUATIONS IN ECONOMIC WELFARE.

The Indian provinces exhibit medium and low growth-coefficients. One of them, Bengal, is almost the last in the list of the low, beaten only by France. The majority are in the medium group (5-10). Let us now examine the relations of the Indian provinces with the comrades of their own groups. We shall take the following equations from Group III :

1. Bihar and Orissa (8·7)=almost U. S. A. (8·4)
2. United Provinces (5·81)=almost Germany (6·3)
3. Indian average (6·82)=almost Germany (6·3)

We understand that the rate af growth per thousand in Bihar and Orissa is almost the same as that in the U. S. A. Likewise is the rate in the U. P. nearly identical with that in Germany. And since the German rate lies halfway between the average for all British India (6·82) and that for the U. P. (5·81), the Indian average may be taken for ordinary purposes to be almost the same as the rate of growth in Germany. Do these parities in growth indicate real parities in demographic conditions between the peoples? Is it possible on the strength of these equations in the rate of natural increase of population to assert that the socio-economic structure or efficiency of the regions concerned is similar or equal? An intensive analysis is required.

In Bihar and Orissa the growth-rate 8·7= birth-rate 35·6 minus death-rate 26·9. Here is an instance of a "medium" G. R. derived from a "high" B. R. as well as a "high" D. R. But in the case of the United States, G. R. 8·4= B. R. 20·6 – D. R. 12·2. The "medium" G. R. is in this instance derived from a "medium" B. R. and a "low" D. R. In order to achieve the same result as the U. S. A. Bihar and Orissa produces 1·75 times as much and wastes 2·2 times as much as the former. From the standpoint of social happiness or national welfare there cannot, therefore, be any equality or similarity between the two regions. The equation in growth should not, therefore, mislead the statistician as to any equation in efficiency conditions.

The same observations are to be made in regard to the relations between the United Provinces (or India) and Germany. The "medium" G. R. of the U. P.="high" B. R. (34·01)—"high" D. R. (28·20). In Germany, on the contrary, the same "medium" G. R. = "low" B. R. (18·3)—"low" D. R. (12·0). The U. P. obtains the same result as Germany, but the process in the former involves 1·85 times as much procreation and 2·35 times as much waste as in the latter. There is greater economy, greater rationalization and therefore greater happiness and efficiency in population matters in Germany than in the U. P. (or for that matter in India).

Incidentally, be it observed that the efficiency situation in Germany is of a slightly higher level than that in the United States. In the latter country B. R. is "medium" while in Germany it is "low". The difference, however, is not great between 20·6 in the U. S. A. and 18·3 in Germany. It is, however, but necessary to observe that simply because two regions happen to be comrades or neighbours in the G. R. they are therefore economically and socio-culturally not necessarily on the same efficiency-niveau.

From this standpoint the relations between Italy and Rumania would throw some fresh light on the question of growth. In G. R.

Italy (11·2)=almost Rumania (11·9)
But in Italy G. R. 11·2=B. R. 26·9 – D. R. 15·7 and
in Rumania G. R.11·9=B. R. 34·1 – D. R. 22·2

Thus in order to produce nearly the same result Rumania spends 1·26 times as much

energy in creation and wastes 1·41 times as much as Italy. Compared to New Zealand, however, whose G. R. (11·8) is almost the same as Italy's, the situation is different, because

in New Zealand G. R. (11·8)=B. R. 20·2 - D. R. 8·4

To obtain the same result in growth as New Zealand Italy produces 1·33 times and wastes 1·86 times as much as the former. Although Rumania, New Zealand and Italy are close neighbours in the growth-group their comradeship is socio-economically of hardly any significance. In the fundamental conditions of efficiency and welfare New Zealand is much higher than Italy and Italy much higher than Rumania. The growth-index as such in thus no index to the economic and social well-being of the peoples.

To come back to an Indian province, say Bengal, which finds itself almost at the bottom of the "low" group, sandwiched between Austria and France. Let us examine Bengal's relations with her nearer neighbour Austria. In G. R.

Bengal (2·6)=almost Austria (2·9)
But in Bengal G. R. (2·6)=B. R. (28·9) - D. R. (26·3)
whereas in Austria G. R (2·9)=B. R. (17·8) - D. R. (14·9)

The "low" G. R. in Bengal is derived from a "high" B. R. and a "high" D. R., while the same "low" G. R. in Austria evolves out of a"low" B. R. and a "low" D. R. Economy, rationalization, efficiency and happiness in population matters are lower in Bengal than in Austria in as much as the former must invest, so to say, 1·62 times and waste 1·83 times as much as the latter in order to arrive at the same goal.

Comrades in growth-coefficient are not necessarily comrades in economic efficiency and social well-being. Statistically this is due to the fact that one and the same region does not invariably find itself in the same kind of group, high, medium or low, in its birth, death or growth-functions. Growth-equations are then independent of efficiency equations. It is not necessary at this point to discuss the ideally best rate of growth for a people or to point out exactly which rate should be the goal for a people to arrive at in the next stage of its socio-economic endeavours. Whatever be the "ideally best,' or the "next best" rate of growth, it is clear that some of the peoples discussed above might arrive at their existing rate of growth with other birth rates and other death-rates.

Thus, supposing that the rate of growth for Bihar and Orissa were to remain what it is (18·7), the province might be more efficient economically and socially if its birth-rate were to come down from 35·6 to, say, the U. S. birth-rate of 20·6, and if in stead of the death-rate being 26·9 it were reduced to 12·2. Italy's efficiency and well being might likewise improve even at the present rate of growth (11·2) if her B. R. were to come down from 26·9 to the New Zealand rate of 20·2 and D. R. from 15·7 to 8·4. Similarly, in the case of Bengal with her existing growth-index (2·6) she might add to her economic power and social welfare if her B. R. were reduced from 28·9 to the Austrian rate of 17·8 and her D. R. from 26·3 to 14·9.

To what extent these demographic transformations are questions of practical politics for economic statesmanship may be understood from the recent population history [3] of Germany. But for the present it is enough to indicate that some very fundamental problems of applied sociology are involved in the considerations of international growth-rates. Since growth-groups are identical neither with birth-groups nor with death-groups, and since, again, birth-groups are not identical with death-groups, the formulation of a population policy for no matter what region, would necessitate the readjustment of indices on practically every front.

4. Comparative Growth-Indices.

The birth-rate is dynamic. Equally dynamic is the death-rate, but its variations are not identical with those of the birth-rate. The death-line follows its course not necessarily

(3) *Deutsche Wirtschaftskunde* (Berlin, 1930, Statistisches Reichsamt) pp. 21-22, 27-28; Helfferich: *Die Entwicklung des Volkswohlstandes* (a chapter in *Soziale Kultur und Volkswohlfahrt waehrend der ersten 25 Regierungsjahre Kaiser Wilhelm II.* (Berlin 1913), p. 823.

parallel to the course of the birth-line. The result is that the growth-rate is also dynamic and that the peaks and depressions of the growth-curve possess an independent standing. The changes in the annual growth-rate (per 1,000) of certain regions including the Indian from 1905 to 25 are indicated in the following table : (4)

Region	1905 – 9	1921 – 25	Variation + or – in %
1. India	2·3	8·5	+269·5
2. Japan	11·0	12·8	+ 16·3
3. Germany	14·0	8·8	– 37·1
4. England and Wales ...	11·6	7·7	– 33·6
5. France	0·6	2·0	+233·3
6. Italy	10·9	12·2	+ 11·9
7. Russia	16·1	20·0	+ 24·2

In the course of two decades the rate of growth has gone down in certain countries and up in others. The descending curve is exhibited by Germany and England, and as the chart VII indicates, the rates of descent in the two cases are almost parallel, although the descent is a little steeper in the former. Compared to 1905-9 the rate of growth in 1921-25 is in the case of Germany 37·1 per cent and in that of England 33·6 per cent lower. The remaining five countries exhibit a heightening of the rate of growth. The rates of variation are diverse as indicated below :

1.	India	... ...	269·5%
2.	France	... ...	233·3%
3.	Russia	... ...	24·2%
4.	Japan	... ...	16·3%
5.	Italy	... ...	11·9%

These rates of increase in the rate of growth are embodied in the chart VII which shows that India and France represent the highest increase and are almost parallel, although France's rate is a little lower.

It is rather a complicated question to ascertain the exact rate of natural growth in the Indian population, first, because from census to census new territories have been included and secondly because the statistical method itself has improved. But with due precaution the rates from 1872 to 1931 may be indicated as follows : (5)

1872-1881	...	1·5	per thousand per year
1881-1891	...	9·6	,, ,,
1891-1901	...	1·4	,, ,,
1901-1911	...	6·4	,, ,,
1911-1921	...	1·2	,, ,,
1921-1931 (6)	...	10·2	,, ,,

During the last sixty years there has been a tendency on the part of the rate to come down to something below 2 every alternate decade. There have been three descents, the lowest depression being so low as 1·2. The curve is therefore very irregular as the chart VIII will show. The peaks, again, do not seem to possess any uniformity, for the level of the two nearest peaks 9·6 and 10·2 are broken in by 6·4. Altogether, it is unsafe to speak of any distinct tendency or law in the rate of growth of the Indian population.

On the other hand, it is possible to speak of something like a general tendency of growth-index in the case of certain peoples. Thus, from 1840 on, the rate of growth was rising (1) in England and Wales down to 1880, (2) in Sweden down to 1890, (3) in Belgium down to 1900 and (4) in Holland, Denmark, Germany, Austria, Italy and Switzerland down to 1910. In France the rate came down from 1840 to 1880 but since then has been irregularly rising and falling. The decade 1911-21, (covering as it does the war-period), is characterized by fall in all these instances. But during 1921-25 the tendency of the curve to ascend is very manifest. Even France with growth-index (2) in 1921-25 exhibits a state of things which has been unknown in her population-history since 1880. In England and Germany, however, the rate although rising did not reach the levels of 1901-10. Since 1926 the growth-index has been falling again almost everywhere. In the following table the growth-line of India is exhibited in

(4) *Annuaire Statistique International 1928* (Geneve), p. 23, *The Financial and Economic Annual of Japan*, 1926. (Tokyo), p. 3, *Compendio Statistico 1930*, pp. 33-35.

(5) *India in 1927-28*, (Calcutta 1928), Table facing p. 91.

(6) Announced by the Census Department in March 1931, as the result of the latest collection of population statistics (*Associated Press of India*).

the perspective of the growth-lines of these countries from 1840 to 1925 (1928) : [7]

	1840 to 1850	1851 to 1860	1861 to 1870	1871 to 1880	1881 to 1890	1891 to 1900	1901 to 1910	1911 to 1920	1921 to 1925	1928
					(*a*)					
England and Wales ...	10·2	11·9	12·7	14·0	13·4	11·7	11·8	7·4	7·7	5·0
					(*b*)					
Sweden ...	10·5	11·1	11·2	12·2	12·2	10·7	10·3	7·7	6·7	4·2
					(*c*)					
Belgium ...	6·6	7·8	7·6	9·7	9·7	9·8	9·7	2·4	7·1	6·0
					(*d*)					
India ...	—	—	—	1·5	9·6	1·4	6·4	1·2	8·5	8·0 (1927)
					(*e*)					
France ...	4·1	2·4	2·7	1·7	1·8	0·7	1·2	2·3	2·0	1·7
					(*f*)					
Holland ...	6·8	7·7	10·4	11·9	13·2	14·1	15·3	13·5	15·3	13·7
Denmark ...	10·1	11·9	10·8	12·0	13·4	12·7	14·5	11·9	11·0	8·6
Germany ...	9·3	8·9	10·3	11·9	11·7	13·9	14·3	3·7	8·8	6·3
Austria ...	5·2	6·2	8·0	7·5	8·4	10·5	11·4	1·0	6·3	3·1
Italy ...	—	—	—	7·0	10·7	10·7	11·1	7·8	12·2	10·4
Switzerland	—	—	—	7·3	7·2	9·1	10·1	6·3	6·9	5·3

A glance at the chart IX will reveal that the Dutch peak (15·3), the German peak (14·3), the British peak (14·0), the Italian peak (12·2), and the Austrian peak (11·4) are unknown in the annals of Indian population since 1870. On the other hand the Indian depths 1·5, 1·4 and 1·2 are unknown in the international statistics of population. The only exceptions seem to be (1) France where the rate comes down to 0·7 during 1891-1900, to 1·2 during 1901-10 and to – 2·3 during 1911-21 (war-period), and (2) Austria where during the war-period the rate comes down to 1·0.

Certain facts bearing on the comparative growth-lines of nations deserve notice :—

1. India's growth index including the most (10·1) (for1921-1931), was never as high as those (*a*) in England and Sweden from 1840 to 1910, (*b*) in Denmark from 1840 to 1925, (*c*) in Germany from 1861 to 1910, (*d*) in Italy from 1881 to 1910, and (*e*) in Holland from 1861 to 1925. The growth-line in India has been haphazard and in any case very modest, nay, poor. (Chart IX).
2. The decade 1911-1921 is exceptional for Europe as covering the war-period. The rate of growth for the belligerents during this period cannot be taken to be normal.
3. During 1921-25 the growth-index was improving among the belligerents. But nowhere among the peoples in the table did the rate catch up to or go beyond that of 1901-10 except in Holland, France, Italy and India (as well as in Russia and Japan, as we have seen before). Indeed, Italy's peak in 1921-25 is higher than any recorded in her statistics. Holland with 15·3 was likewise in another period of her highest index. Since 1925 the rate of growth has been falling again.
4. Down to 1925 the facts of population statistics do not on the whole justify generalization to the effect that entire Europe or Western Europe is exhibiting the tendency to "cataclysmal" fall in the rate of growth. Generalizations embracing a larger area of course are out of the question.
5. The entire period of the falling growth-rate in so far as it is a fact of certain countries, is to be measured by not more than 20 years, of which the exceptional war-period constitutes 25 per cent.
6. So far as India is concerned it is not possible, as we have observed before, to speak of a general tendency. But should India be in a position during the next generation to maintain an ascending growth-curve in tune with the rising tide of industrialization she would be but following, as in other phases of economico-cultural development, the footsteps of the pioneers from 1840 to 1910 or even to 1925. Sociologically, India may be expected to witness an

(7) Woytinsky. *Tatsachen und Zahlen Europas* (Wien 1930), pp. 64-67, *Die Welt in Zahlen*, Vol. I. (Berlin 1925), pp. 78, 101 ; *Compendio Statistico 1930*, p. 35, *Bayerns Entwicklung seit 1840* (1915), pp. 8-9.

epoch of increasing growth-rate corresponding to the experiences of England, Sweden, Belgium, Holland, Denmark, Germany, Austria, Italy and Switzerland during the previous two generations or so.

IV. POPULATION POLICY FOR INDIA.

It is strange that although material prosperity and free universal and compulsory education have pretty long been enjoyed by the advanced countries of Europe and America they should be ahead of the Indian provinces by so few years as half a generation, one generation or a generation and a half only in regard to modernism in (1) birth-rate, (2) death-rate and (3) infant mortality. Indeed, in spite of poverty and illiteracy, and in spite of epidemics the people of India may be regarded, on the positive basis of comparative and historical statistics, as maintaining a comparatively high sanitary level, and the Indian subcontinent should appear to be, relatively speaking, not so unhealthy as is the general custom to believe. That Indian conditions of general and infant mortality do not happen to be worse than they actually are and that these were prevailing in Germany and Italy some two or three decades or about one generation ago is all the more surprising when one considers the large sums of money that are spent by the governments of these countries directly and indirectly on public health and social hygiene.

In 1928 Germany [1] spent 2. R M (nearly Re. 1-5-3) per head on the diverse items of sanitation and health. For Italy in 1926-27 the figure was 24 lires (Rs. 3-6-6) per head. England and Wales spent during 1927-28 nearly 1½ shilling (Re. 1-0-0) per head for the same purposes. The sanitation budget of Japan accounted for 2½ yen (Rs. 3-5-3) per head during 1927-28. In France the corresponding figure for 1927 works out at 9 francs (Re. 1-0-0.)

In India [2] the public expenditure on health comprises the following items (for 1926) :

1.	Hospitals :	Rs. 36,189.854
2.	Health functions of municipalities (water supply, drainage etc,) ...	Rs. 41,407,225
	TOTAL ...	Rs. 77,597,079

For 247 million people in British India the expenses come up to $4\frac{1}{6}$ annas ($4\frac{3}{4}$ pence) per head.

Should the Indian people happen to possess control over their public finance and be in a position to assume the direction of their health and sanitation as well as education, industrial and technical departments it is reasonable to surmise that more funds will be placed at the disposal of the public for the improvement of mortality conditions. And even without spending as much per head as Italy, Japan, Germany, France and England the different regions of India may be expected to catch up to or approach the pioneers of modern civilization in death-rates and infant mortality rates in the near future.

It has been observed above that the general as well as the infant mortality indices in India have begun to decline. This decline will be accelerated as soon as improvement of sanitation and public health as well as war against preventible diseases [3], the diseases of poverty,—such as cholera, dysentery, leprosy, malaria, plague, typhoid

(1) *Annuaire Sanitaire International 1928* (Geneve) : Germany, pp. 66-69, France, pp. 413-430, Italy, p. 537, Japan, p. 554, England and Wales p. 825. The items brought together in this *Annuaire* for the different countries are not strictly comparable.

(2) For expenditure on hospitals in India see *Statistical Abstract for British India* (1917-27), p. 395, and for health expenditure of municipalities see the *Annual Report of the Public Health Commissioner with the Government of India for 1926*, (Calcutta, 1928), p. 110. See also Sarkar : *Comparative Pedagogics in Relation to Public Finance and National Wealth* (Calcutta, 1929), pp. 94-95.

(3) For deaths and diseases in contemporary India see *Statistical Abstract* (1917-27), pp. 386-392. Compare the recent history of cholera, plague and pox in Europe in Woytinsky : *Die Welt in Zahlen*, Vol. I, p. 110, Vol. VII, pp. 220-221.

fever etc.,– are sought to be effectively [4] financed by the government under Indian inspiration and Indian personnel. These diseases or rather the more virulent of them are not the exclusive monopolies of Indian climatic or social conditions. They used to flourish in Europe in the past and have not yet entirely disappeared from the European continent. And undoubtedly most of these diseases can be controlled in India as they have already been controlled in some of the regions of Europe. Students of comparative vital statistics may, therefore, expect in India in the near future a heightening of the rate of natural growth, *i. e.* of the rate of excess of births over deaths per 1000 inhabitants.

The prospects, however, curiously enough, can hardly be appraised as thoroughly satisfactory or desirable. The prevailing standard of living and efficiency of the people of India is, like the income per head, notoriously low. The poverty is unspeakably deep. This is but another way of stating the simple fact that the Indian subcontinent has already reached a saturation point in terms of population, or in other words, that the area is, relatively speaking, overpopulated. The expected increase in the rate of growth can but help to lower the standard of living and increase the degree of poverty, *i. e.* deepen the overpopulation difficulties still further. We are face to face with the problem of maintaining the standard of living at the present level, preventing it from going down, and if possible, attempting to raise it, thereby preventing overpopulation from making fresh inroads on the resources of the region, *i. e.* poverty from making further conquests.

Here indeed we touch the most vital problem in the population policy of nations, namely, the question of the birth-rate. A decline in the death-rate is not necessarily an unmixed blessing, for a rising growth-rate which is a result of this, may very often spell an economic misfortune. The other side of the shield, namely, the birth-rate has also need to decline, if *other circumstances remaining the same*, the decline in death-rate is to produce beneficial effects. It should not be ignored that some of these "other circumstances" can be intelligently brought into being in an organized manner. The evil of the rising growth-rate, in so far as certain regions are concerned, can to a certain extent be counteracted, for instance, (1) by emigration and (2) by economic development, internal and external. It cannot be denied, historically speaking, that among the pioneering nations during the last two generations the rising or high growth-rate has gone along with an actual rise in the standard of living, and that both these factors have been associated with emigration and economic development as diverse limbs of one social complex. In regard to India as to other countries, therefore, the limits of emigration and economic development have to be constantly watched while studying questions bearing on the growth-rate, standard of living, overpopulation etc. While it is not necessary to be ultra-pessimistic on the question of a high growth-rate it is prudent not to ignore the possibilities of increasing poverty and diminishing economic and cultural efficiency.

We have already observed in regard to efficiency questions that in order to maintain a growth rate, say, the American rate (8) it is not enough for India to lower the death rate only to the American level (from 26·8 to 12·2), for this can but lead to a tremendously high growth-rate. The birth-rate also has to be brought down from 34·8 to 20·5 (American). The control of deaths in India through the eventual organization of better sanitary and health measures will therefore have to be met by a more or less corresponding control of births in a conscious and deliberate manner. At the same time, India's claims to colonizing and developing Africa, South America, and Australia will naturally also begin to press upon the world-economy. And finally, the industrialization [5] of India on an extensive and intensive scale is sure to become a prominent item in the economic statesmanship of the people in order, among other things, to create avenues of employment for a part of the increasing population. In population as in other items of contemporary economics India is thus tending to repeat the problems and solutions of the pioneering nations. [6]

(4) For hospitals and dispensaries in India see *Statistical Abstract (1917-27)*, pp. 394, 396. Compare the position in Germany, Switzerland, U. S. A., Norway, Sweden, Austria, Hungary, Denmark, Lettland, Poland, Russia, Belgium, France, Japan, New-Zealand and other countries in Woytinsky: *Die Welt in Zahlen*, Vol. VII, p. 213. Compare likewise the numerical strength of the medical profession of all ranks in India (*Statistical Abstract 1917-27*, p. 40) with that in other countries (Woytinsky VII, p. 211; *Annuaire Sanitaire International*, France, p. 413, *Statistisches Jahrbuch fuer das Deutsche Reich 1928*, Germany, pp 486-487).

(5) Sarkar: *A Scheme of Economic Development for Young India* (Calcutta, 1926).

(6) Be it observed, however, that certain recent tendencies in the population policy of France, Germany, and Italy seek to counteract the "international birth strike" and promote the growth-rate; Mussolini: *Il Numero come forza* (*Gerarchia*, Rome 1928); F. Zahn: *Wie die Familie so das Volk* (Munich 1930). The opposite tendency is represented by East in *Mankind at the Cross-Roads* (New York 1925).

NOTE—This monograph is based on the author's Italian Original entitled *I Quozienti di Natalita, di Mortalita e di Aumento Naturale nell' India attuale nel Quadro della Demografia Comparata* presented at the International Congress for studies regarding Population Problems (held at Rome, September 1931) at which he was a president of the Economic Section.

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Editorial Comments

The report of the Indian Drugs Enquiry (CHOPRA) Committee contains much information and many suggestions that are valuable. It seems to us, however, that before Government can think of introducing any legislation, the first essential is the compilation of an Indian Pharmacopœia. The Indian Medical Association has time and again urged the point upon the attention of Government, for without this essential reference to the strength and standard of drugs, any legislation would be absurd. We admit there are difficulties to be faced in the preparation of an Indian Pharmacopœia on account of the diversity of views entertained by followers of the various systems of medicine found in India, but such difficulties are not insuperable and must be overcome by proper interpretation, conciliation and a sympathetic attitude throughout. In any case, the preparation of a pharmacopœia would take a little time but still it would be better to undertake it before the introduction of premature legislation. There is no need to hurry the legislation, but there is need to get on with the preparation of the pharmacopœia. We also maintain that when legislation is decided upon, it should be introduced in the Central Government rather than in the various provincial Governments.

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Amongst the measures recommended by the Committee is the establishment of a Central Laboratory to co-ordinate the work of the provincial laboratories. On this matter, we are afraid we must join issue with the Committee, for, apart from its being a heavy and unjustifiable burden on the hardpressed taxpayer, particularly at such a time of financial stringency, it would be far better to encourage the development of laboratories in the provinces, in association with the Universities and scientific departments. Indeed, in other countries the Universities are generally entrusted with this business. An isolated central laboratory would lack the cultural and scientific environment found in the provinces, which is so important to the development of any scientific organisation, and we may cite the instance of the Central Research Institute at Kasuali, the work and importance of which can hardly be said to justify the large expenditure on that institution from year to year. We also think the Committee have not fully appreciated the vast area of India and the practical difficulties that arise with a Central Laboratory in that connection. It would, in our opinion, be far better, especially under the contemplated Federal Scheme, for each province, which is a big enough unit in itself, to have its own laboratory, under the control of its own Government. So far as the co-ordination of the work of the several provincial laboratories is concerned, this could be effected conveniently and efficiently by the constitution of a committee consisting of the directors of provincial laboratories, who would meet as occasion required. To them could be entrusted the task of co-ordinating work and laying out standard methods of testing, in fact all the functions of a Central Laboratory could, without additional expense, be performed by them. Research could be undertaken by the provincial laboratories according to the funds available for the purpose from the local Government. For chemical, bio-chemical or biological assay adequate numbers would, we are sure, be obtainable in a province. Public analysts could be trained in each of the laboratories according to the requirements of the province, while the commercial testing of drugs could also be conveniently done, on payment of fees, in the provincial laboratories. We feel very strongly on this point because an isolated Central Laboratory, supervising the work of important provincial centres would be an anomaly, and lack the vital elements of growth.

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For the preparation of stable standards the different institutions of Europe and America empowered by the League of Nations supply, free of charge, standard preparations for the maintenance of uniformity in those preparations throughout the world. From this standard the provincial laboratories could well prepare their own standard preparations, which may from time to time be verified by sending them to those laboratories in Europe and America. The guidance, co-ordination and correlation of such work would be effected by the committee suggested above. For expert referee, it is not necessary that there should always be a High Court in scientific testing. In case of any dispute the drug in question may be sent to another provincial laboratory for an independent test. It is not necessary for this purpose to have a Central Laboratory and, in fact, for these various reasons it will be seen that a central laboratory is really superfluous.

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Regarding the committee's recommendation for the constitution of an advisory committee, we do not understand why the Director-General of the Indian Medical Service should be included in such a committee. The special requirements of the provinces can be determined by the local Governments quite easily and so far as their common interests are concerned these would be met by the formation of a committee of the directors of the various provincial laboratories, such as we have suggested, but in any case the inclusion of the Director-General does not appear to be warranted by any substantial reason. For our part we favour the idea that every provincial laboratory should have a council, consisting of reputed chemists, professors of pharmacology of the Medical College or School and bacteriologists—all of high status, so as to ensure honesty. These councils are, of course, in addition to the committee of directors of the provincial laboratories suggested in our second paragraph.

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In clause 421 of their report, the Committee remark "Samples of imported biological and organo-metallic compounds should be sent to the central laboratory and there should be no delivery to the consignee until the inspections *etc.* are complete." In making this suggestion the Committee, it seems, has lost sight of the great amount of harassment that would be caused to the poor importer, for possibly no fault of his own but that of the manufacturer. We agree that the inspector may take the sample and send it for testing to the provincial laboratory but there is absolutely no necessity to keep a consignment of drugs in custody till the report of the central laboratory is forthcoming. There are many drugs which may be spoiled by faulty storage in the Customs house. The situation would be met by binding the consignee not to offer the products in question for sale until the test report had been received. Again, in clause 423, we see it is proposed to penalise the importer of drugs or chemicals for the offence of the manufacturer. This we think is extremely hard on the importer, and a more equitable method ought to be devised.

* * * * *

We fear we do not quite understand how the Surgeon-General, Government of Bengal should come to advertise for eight new medical men for the provincial grade. If these men are intended for posts in the departments of medical education on civil medical relief, then we must enter a protest, for we think that for these posts honorary medical workers could easily be recruited, and in these days of economy we should have thought that Government would be only too willing to avail themselves of the services of honorary workers. We have constantly referred to the necessity for honorary medical workers in a large number of posts that are now stipendiary, both as a matter of economy and as a means of providing an opportunity for experience to new and capable men. Except for posts of demonstrators in the medical colleges and schools, resident officers in the hospitals and health officers, there is absolutely no need for paid officers. The honorary system has been in vogue for some time in Madras and we are reliably informed that it is proving very satisfactory. If it can work in Madras there is no reason why it should not work in Bengal, where there is a larger number of qualified medical practitioners, among whom honest and capable men willing to work without any kind of honorarium could readily be found.

Medical News and Notes

[Items of news and notes of general interest to the Profession for incorporation in this section from the members of the profession will be greatly appreciated—EDITOR]

Research Health Officer for Madras. It is understood that the Madras Government has appointed Mr. P. V. GEORGE, who had been carrying on research in plague under the Indian Research Fund Association to the post of Research Health Officer which was created recently, as a temporary measure.

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Local Board Medical Institutions. The Madras Retrenchment Committee recntly recommended that recruitment to the Government cadre of Sub-Assistant Surgeons should be stopped or regulated in such a way as to enable the number of private practitioners in the employ of local boards to be gradually increased to fifty per cent of the number of Government Sub-Assistant Surgeons as against the present 25 per cent without throwing the existing Government servants out of employment. The Government have accepted the recommendation in principle and have decided that Government Sub-Assistant Surgeons employed in local fund medical institutions other than those at head quarters of taluks and Dhanushkodi should be withdrawn from these institutions gradually as vacancies arise in Government cadre. Local boards which desire to appoint their own medical officers to such medical institutions are directed to address their requests in this behalf to the Surgeon General, who will register them and forward them to the Government as vacancies arise in the Government cadre. In deciding the order of priority in which to comply with the requests of various boards the circumstances of the local boards concerned and the number of appointments under them already held by private practitioners would be taken into account. It is stated that there would be no recruitment to the Government cadre till all the Sub-Assistant Surgeons now employed under local boards in medical institutions other than those at taluk headquarters have been replaced by local fund medical officers

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Strikes in Medical Schools. The frequent strikes of students in the various medical institutions in Bengal were strongly commented upon recently by the Minister for Local Self-Government, while presiding over the annual prize distribution of the Campbell Medical School. He said that strikes were being indulged in as the easiest means of getting their grievances removed—grievances which were often imaginary or exaggerated. This lack of responsibilities could not be viewed with equanimity by the Government, would not be tolerated by the public and the parents and guardians of the students, who paid for their education. It was really playing with human life which even the worst provocation could not justify.

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New Principal of Calcutta Medical College. Lt. COL. T. C. BOYD, I. M. S., Chemical Examiner to the Bengal Government and Professor of Chemistry, Medical College, has been appointed as Principal of the College and Superintendent of the Medical College Hospitals, in place of Lt. COL D. P. GOIL, who has been appointed Inspector General of Civil Hospitals Punjab. It will be remembered that Lt. COL GOIL was the first Indian to be Principal of the Calcutta Medical College.

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Calcutta Hospitals. In defence of the criticism levelled against the Bengal Government regarding the inadequacy of beds in Calcutta hospitals, the Hon. Minister in charge of the department, stated at a recent meeting of the Legislative Council, that "the total number of beds in the State hospitals in Calcutta was 1,657 in 1920, 1,837, in 1925, 1,919 in 1930 and 1,951 in 1931. Their number in the corresponding years in hospitals aided by the Government was 587, 663, 735 and 763, whereas the number of indoor patients in State hospitals rose from 28,483 in 1920 to 31,486 in 1930, and in Government aided hospitals from 9,039 to 12,450 between 1920 and 1930; so that while the number of beds increased only by 500, by no means a small increase, the number of patients went up by about 6,000."

"The problem of medical relief and of providing adequate accommodation for patients who flock to Calcutta, practically from all parts of India" said the Minister "is more serious than it is thought to be. With the present resources of the Government, further expansion is a difficult question and it can only be done if larger sources of revenue are alloted to Bengal or the public come forward with more generous contribution. I would ask the house to realise that we have to provide not for the needs of this province only, but indirectly also for a large number af people belonging to other part of India."

* * * * *

The Lubeck Misadventure. The curtain has fallen on the long-drawn tragedy enacted at Lubeck as result of the worst misadventure on record. Our readers will remember that 69 children had to face death and the 131 more had to pass through serious illness as the result

of some contamination of B. C. G. Vaccine. After a harrowing trial, two of the most respected of the German Medical profession have been convicted of negligence, even to such an appalling extent, that they should be imprisoned like common malefactors. Prof. George Deuck of the Lubeck General Hospital, has to serve two years for manslaughter, while his younger colleague, Dr. Altsaedt (practically the Medical Officer of Health) who was found guilty in a lesser degree, received a sentence of fifteen month.

A Short Note on Surgical Tuberculosis

By SURESH CHANDRA DAS GUPTA, L.M.S.,

Senior Surgeon and Chief Medical Officer, Bir Hospital, Nepal.

I met with almost every variety of surgical tuberculosis in my practice here. This form as well as pulmonary tuberculosis are too common in this valley, namely Katmandu, the capital of Nepal.

Tuberculosis of lymphatic glands (specially of neck, axilla and groin—more common in girls), and of skin in the form of lupus (specially of face and chest), caries spine, tuberculous joints (hip, ankle and knee being very usual sites), tuberculosis of middle ear, eye, testicle, bladder and intestines, empyema resulting from tuberculous affection of pleura or lungs, and fistula-in-ano of tuberculous origin, are treated in large numbers in the hospital and also in private. Many of these untreated and chronic cases ultimately die of phthisis.

Space being short I shall touch only the main outlines of treatment which I found efficacious.

I. In *non-suppurating* glands, early removal of the primary foci of infection, as in the case of malignant growths, affords a better chance of recovery. Wounds heal by primary intention; but in bones, joints and spine better prospects are attained by physiological rest, by securing favourable condition of circulation, position of the patient and immobilization of the affected part with splints or plaster of Paris.

II. In the *suppurating condition* aspiration and refilling the cavity with iodoform emulsion, repeated several times, or failing that—opening, drainage, irrigation, scraping and finally excision or removal of the affected part (if possible) are the rational methods of procedure. Dry dressings are preferable and strictest asepsis is necessary. Local application of iodoform, BIPP or BIPP with guaiacol, or Vegol Guidol (Blanchard-Ohio) are the best; iodine or guidol may be tried if iodoform is found unsuitable,

III. Lastly, in tuberculous affection of *organs that can be removed*, I am of opinion that early removal affords only a chance of recovery, as in the case of testicle, ovary, affected skin, eye etc. In a prolonged and extensive suppuration of joints amputation holds out the last chance. Injections of tuberculin in some early cases did not show very promising results; but still this is entitled to a more extended trial.

Operations should only be undertaken so long the general condition of health is not very bad, and the appetite good. It is useless to operate on a moribund patient.

A word about *general management* in conclusion: Change to a dry climate, sea-side, pine-forest and high-altitudes etc., nutritious and fresh food, raw-meat juice, fruits having high vitamin contents and above all exposure to open-air and sun-shine, or in its absence ultra-violet rays applied *direct* to the affected part are most important of all. Pure cod-liver oil, vitamin by mouth, and injections of calcium, sodi-morrhuate and iodine often enhance the resisting power, and helps calcification.

CASE-NOTES.

Case I. The patient had an ilio-psoas abscess with profuse caseating discharge, and complained of severe back-ache ; the third lumbar vertebra was found affected. A probe was passed through

Case I.

the iliac opening upto the spine and a counter-opening made ; the affected body of the vertebra was scraped out. Dressings with iodoform emulsion resulted in complete recovery.

Case II. The patient, a boy, had tuberculous suppuration of the sterno-clavicular joint, with a hissing sound of air coming out of the chest during acts of respiration, besides a burst tuberculous left hip. Apart from medical treatment, cod-liver oil was daily massaged and the patient was left in the open terrace morning and evening in the sun. He was completely cured.

CASE III. In one single family I was called to examine seven cases of ottorhœa at different periods. All were quite young and only one of them was 21 years of age. Two of them developed phthisis and died. One had mastoid abscess and was operated upon. He was cured. Another developed signs of meningitis and pressure symptoms and was semi-conscious. He was also operated upon, and an abscess was foud in the region of the temporo-sphenoidal lobe ; about 4 ounces of foul-smelling, thin, watery pus with caseous masses was drained out. The case completely recovered. He has still sight diplopia.

Case II.

CASE IV. A young man of 20 had been admitted for swelling of the right testicle. It was found to be tuberculous, and removed. After three years he again came to me with affection of the left testicle with enlarged glands. Wassermann Reaction was negative. So, I removed the left one also. He had morning cough, slight evening rise of temperature, night sweats and tubular breathing at the left apex. I kept him in open air and in the sun. He also had calcium injections and cod-liver oil by mouth. I saw him again after eighteen months and found him doing quite well.

VIII All-India Medical Conference

Report of the Scientific Section.

Abstracts of 91 papers were received within three weeks of issuing the appeal for contributions. The abstracts of the papers were printed in book form and supplied to members of the Conference.

To facilitate discussion on the papers, the Scientific Section was sub-divided into 10 sub-sections, *viz:* Ophthalmology, Internal Medicine, Obstetrics and Gynæcology, Pediatrics, Surgery, Tuberculosis, Pharmacology, Pathology and Bacteriology, Public Health and Statistics and Radiology and Electro-therapeutics.

The Scientific Session sat on the 25, 26 and 28th March, holding 5 sectional meetings simultaneously on the first two days. Each section was supplied with an epidiascope for projection and a black board with chalks. Each section had its president and rapporteur. Many of the sections were thickly attended and a keen interest was evinced in the discussions. The sections on Internal Medicine and Radiology and Electro therapeutics had to continue their work till the 28th of March to finish their sectional discussions.

The number of papers in each section presided over by a Sectional President was as :

1.	Ophthalmology ...	6	President,	Dr. D. D. Sathaye., Bombay.
2.	Internal Medicine	22	„	Dr. P. Nandi, Calcutta.
3.	Surgery ...	4	„	Lt. Col. K. K. Chatterji, Calcutta.
4.	Obstetrics and Gynaecology ...	4	„	Dr. N. N. Basu, Calcutta.
5.	Tuberculosis ...	11	„	Dr. A. C. Ukil, Calcutta.
6.	Pathology and Bacteriology ...	16	„	Rai Bahadur Dr. G. C. Chatterji, Calcutta
7.	Pediatrics ...	3	„	Rai Bahadur Dr. H. N. Ghosh, Calcutta.
8.	Pharmacology ...	5	President,	Dr. K. C. Bose, Calcutta.
9.	Public Health and Statistics ...	4	„	Dr. T. N. Majumdar, Calcutta.
10.	Radiology and Electro-therapeutics	16	„	Dr. Joshi, Bombay.

It is a matter of gratification to note that the Radiological Association of India has amalgamated its annual session with the section on the same subject at the 8th All-India Medical Conference. The Scientific Section of this Conference appreciates this help and requests the whole conference to thank them formally for it. We hope other medical societies would find the utility of co-ordinating with the Scientific Session of the annual All-India Medical Conference and thereby getting the benefit of having a large number of scientific workers assembled at the same place.

Of the papers contributed, 1 was from Birbhum, 1 from Howrah, 3 from Madras, 5 from Patna, 1 from Poona, 1 from Hazaribagh and 1 from Vizagapatam.

We record here our thanks to Messrs. Adiar Dutt & Co., for lending us 4 Epidiascopes and the Bengal Chemical and Pharmaceutical Works fer lending us one Epidiascope for the Scientific Section. DR. A. C. UKIL, Secretary of the Scientific Section, wishes to thank all the contributors, rapporteurs, presidents and members of the Scientific Sub-committee for their co-operation in making the section a great success. Letters of sympathy were received from large number of workers who could not send papers owing to shortness of time. The Scientific Sub-committee realises that, in the ordinary course, such notices should be sent three months ahead of the conference.

Current Medical Literature

Intramuscular Liver Extract Therapy in the Treatment of Pernicious Anaemia.

L. DAVIDSON.

B. M. J. Feb. 13, 1932.

A little over 5 years MINOT and MURPHY demonstrated the efficacy of liver diet in the treatment of pernicious anæmia. In 1927 COHN, MINOT and their associates produced a liver extract by a process of chemical fractioning, but animal experiments revealed that such extracts were unsuitable for parenteral injection, since small amount of contained protein produced dangerous allergic phenomena as well as the presence of a blood pressure reducing substance appeared to be an additional contraindication. The purest preparation of the active principle has been made by DAKIN, WEST and HOWE. The author reports the results of Ganssleus liver extract and concludes that :

1. Its effectiveness is one hundred times that of raw liver given by mouth. No undesirable

local or general manifestation occurred as a result of its injection.

2. Intramuscular liver extract therapy is useful in critically ill cases of pernicious anæmia with marked nausea and vomiting. The necessity for blood transfusion is reduced to a minimum. The so called liver resistant cases of pernicious anæmia should be treated by intramuscular injection of liver extract.

3. In patients in remission stage the fortnightly injection of liver extract enables the maintenance dose of liver to be reduced to limits which can be easily tolerated by all. He further points out the importance of maintaining a normal blood level in such patients for the prevention and treatment of subacute combined degeneration of the cord.

J. N. Dutt.

Resistant Sprue Anæmia yielding to Intravenous Liver Extract.

LEONARD ROGERS AND W. E. COOKE

B. M. J., February 13, 1932, p. 272.

The authors describe a case of relapsing sprue complicated with severe anæmia, which had been under their treatment for about 6 years and they state remarkable and rapid recovery after intravenous hepatex from a dangerous condition of post-sprue pernicious anæmia, which had failed to respond to ordinary methods of liver extract administration. Further severe abdominal symptoms followed a few intravenous injections associated with rapid enlargement of the liver and sufficiently acute to raise the question of serious gastric or duodenal disease. These symptoms subsided when the injections were made by intramuscular instead of intravenous route.

J. N. Dutt.

The Influence of Epinephrine and Insulin injections on Hexose-phosphate content of muscle.

CORI AND CARI.

Journal Bio chemistry Vol. XC. IV. No. 2, pp. 581.

The authors carried out an experiment to study the effect of epinephrine and insulin on hexose-phosphate content of muscle and summarise as follows :

1. The average hexose-phosphate content of muscle removed from the living animal under amytal was found to be 53·3 mg. per cent as hexose and 8·9 mg per cent as P. while the P calculated from the hexose was 9·2 mg. When the hexose-phosphate content of muscle was increased by means of the various procedures described below, the agreement between P determined and P calculated from the hexose content was equally satisfactory.

2. When the muscle is taken immediately after killing an animal, the hexose-phosphate content of muscle is always markedly increaseed and may be as high as 200 mg%.

3. Following subcutaneus injection of epinephrine the hexose-phosphate content of muscle is increased after 15 minutes and reaches its peak after one hour and slowly returns to the basal level 4 hours after the injection.

4. Insulin injections in fasted rats are followed by an increase of hexose-phosphate. When the hypoglycemia is prevented by simultaneous administration of glucose or when insulin is injected into adrenalectomised animals, producing a severe hypoglycemia, the hexose-phosphate content of muscle remains unchanged. Hence it is a secondary output of epinephrine which is responsible for the increase in hexose-phosphate during insulin hypoglycemia.

5. Hydrolysis curves of the muscle extract in N. Hcl gave practically identical values under the different experimental conditions mentioned. There was no indication of an accumulation of hexose-diphosphate (Harden-Yound type) during insulin or epinephrine action, nor was any P split off from adenosinetriphate.

(6) Glucose feeding did not lead to changes in the hexose-phosphate content of muscle while the temporary decrease in blood and urinary phosphate after epinephrine or insulin injection might be due to accumulation of hexose-phosphate in muscle, this explanation does not hold for the decrease in phosphate excution observed after a carbohydrate meal.

J. N. Dutt.

Idiopathic Exudative Pleurisy.

REYE

Hamburg Medical Association 12-1-32.

Nearly half of the patients suffering from exudative pleurisy suffer from tuberculosis of the lungs or miliary tuberculosis. In a series of 1,200 cases of pulmonary tuberculosis 12·5% gave a history of exudative pleurisy. The exudative pleurisy cases should not be treated so lightly as now and should be observed for some years after the attack. In a series of 155 cases diagnosis of tuberculosis was established rontgenologically in 78 cases. In 41% the tuberculous etiology was established by culture and animal experiments. The kidney function test is of value from prognostic and therapeutic

point of view. Deficient water excretion in the beginning and in the height of the disease causes more exudation in the part. *J. N. Dutt.*

Electrocardiographic Changes during Treatment of Severe Diabetes.

K. S. SMITH AND HICKLING

Lancet March, '5, 1932, p. 501.

The authors describe the electrocardiographic changes occurring during treatment of diabetes and summarise as follows:

(1) The most pronounced changes occurred in patients below the age of 40, the T. Waves being commonly flattened in Leads I and II after diphasic in lead III. Increasing amplitude of the T. Waves in Lead I and II and the substitution of an upright for a diphasic T. Wave in Lead III were the effects most frequently observed during treatment. In two patients inversion of the T wave in all Leads was recorded at the outset. All of these changes disappeared progressively during treatment, whether by diet alone or by diet and Insulin. The most uniform change and restoration in Lead II while the T wave in Lead III was more easily influenced by treatment and less stable in its form and direction.

(2) Other occasional electrocardiographic changes occuring during treatment was progressive diminution of the P wave and progressive lessening of slurring in Q. R. S. complexes.

(3) The causal factors underlying the changes described were considered under the following structural and metabolic heads (*a*) coronary sclerosis (*b*) coronary intimal fatty deposition (*c*) abnormal metabolic products (*d*) defective nutrition of the myocardium. The authors conclude that the electrocardiographic changes represent mainly a parenchymatous damage to the heart from defective nutrition. Coronary disease plays subsidiary role in the production of abnormal electrocardiograms.

J. N. Dutt.

ERRATA

[Our attention has been drawn to the following errors in the April 1932 issue (Conference number) of the Journal which we hasten to print with an apology. *Ed., J. I. M. A.*]

						In place of	*Read*
Page	370	1st	col.	18th	line	Assam Zone District	Aschheim Zondek Test
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